

THE IRON AGE

Established 1855

New York, June 5, 1913

Vol. 91: No. 23



The Packard Motor Car Company, Detroit

Bird's-eye view of the Packard plant. On the near side of the boulevard are the power house, the service building and the truck division. On the opposite side, the main office and the chassis division. In the distance, the foundry and forge shop with their own boiler plant.

The Packard Motor Car Company, its product and its plant are by common acceptance one of the pre-eminent factors in the automobile industry. They typify one of the general classifications into which motor vehicles are divided. Intimate information concerning this plant and the methods employed there are in consequence of more than general interest. To the student of manufacturing methods there will be reflected a shop policy which seeks first to establish the most accurate treatment of the metals used in order to secure the desired characteristics of structure and strength, a policy which then holds its machine work within the minimum limits of variance in measurements and finish and which finally verifies its own best efforts with a rigid inspection of the entire product at each stage of manufacture. And the last, notwithstanding that the reasonable presumption of accuracy already existing may give the inspection practice the appearance of redundancy.

A General Description of the Purposes, Plant, Methods and Organization for the Building of Motor Cars and Trucks

BY OLIVER J. ABELL

The annual output of 3500 pleasure cars and 1800 trucks is a matter fixed by marketing conditions, but the low ratio of this production to the Packard plant area, equipment investment and labor cost may be charged to the above omnipresent "check" or secondary defense. To what degree of efficiency production may be brought, where production per se is thus a secondary consideration, is an interesting problem to which the Packard plant contributes a number of profitable suggestions. Production is subservient to the design of cylinders, crank cases, transmission and various other principal parts of the car. Where the design is worked out along the lines suggested by the requirements of maximum production, machining cost becomes a minimum, while capacity and symmetry if not sacrificed are of secondary importance. Where on the contrary, for the purpose of securing maximum power, strength or attractiveness of outline, the car is designed



Fig. 2—Exterior of the Forge Shop Showing an Interesting Type of Construction for the Side Bays in Which the Furnaces are Located. The Side Bays Provide for Their Own Ventilation, Leaving the Monitor to Dissipate the Hammer Smoke



Fig. 3—Interior View of the Side Bay of the Forge Shop Showing Furnace Arrangement, the Roof Pitch and Side Louvers

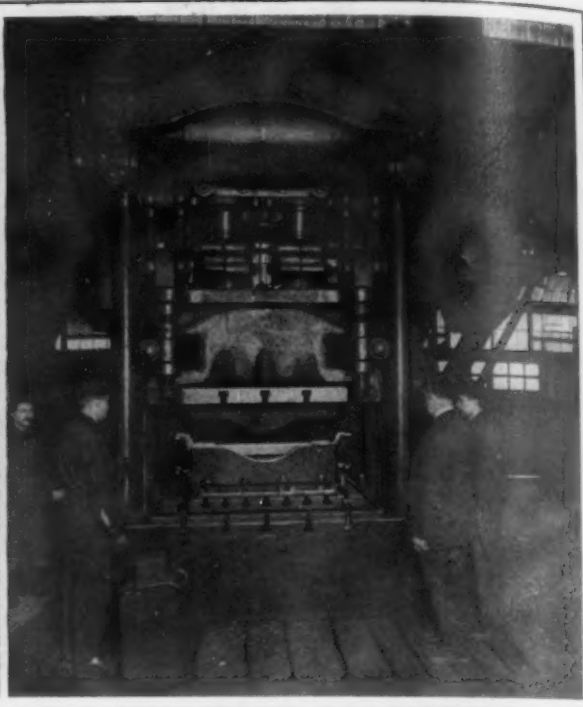


Fig. 5—View Showing the Front Axle in the Press Before Being Formed, but After Bearings at Each End Have Been Forged

primarily to meet certain requirements and the machine equipment and manner of machining are adapted subsequently, the cost of that machining immediately mounts and the production is cut down.

In the manufacture of all the parts for cars and trucks the plant is self contained. A general view of the extent of the plant, the number of buildings and their arrangement may be obtained from Fig. 1, the perspective sketch heading the article. In the immediate foreground of the illustration is the truck division followed by the service building and power plant. On the opposite side of the boulevard, the first building is occupied by the general offices and experimental department. The group of buildings immediately behind includes the heat treatment,

chassis and body building departments, while in the far background about one-half mile distant from the office building are the foundry and forge plants with their detached boiler house. The buildings thus indicated correspond to the six divisions of the general manufacturing department, namely: Forge, foundry, chassis—which includes the machine shop, heat treatment and chassis assembly work—body, truck and service. The machine shop is further subdivided into departments, segregating the machining of motors, transmission, etc., within certain buildings and on certain floors.

The forge division is housed in an isolated building 386 ft. long and 72 ft. wide, to the design of which much more attention has been given than is usually paid to the require-

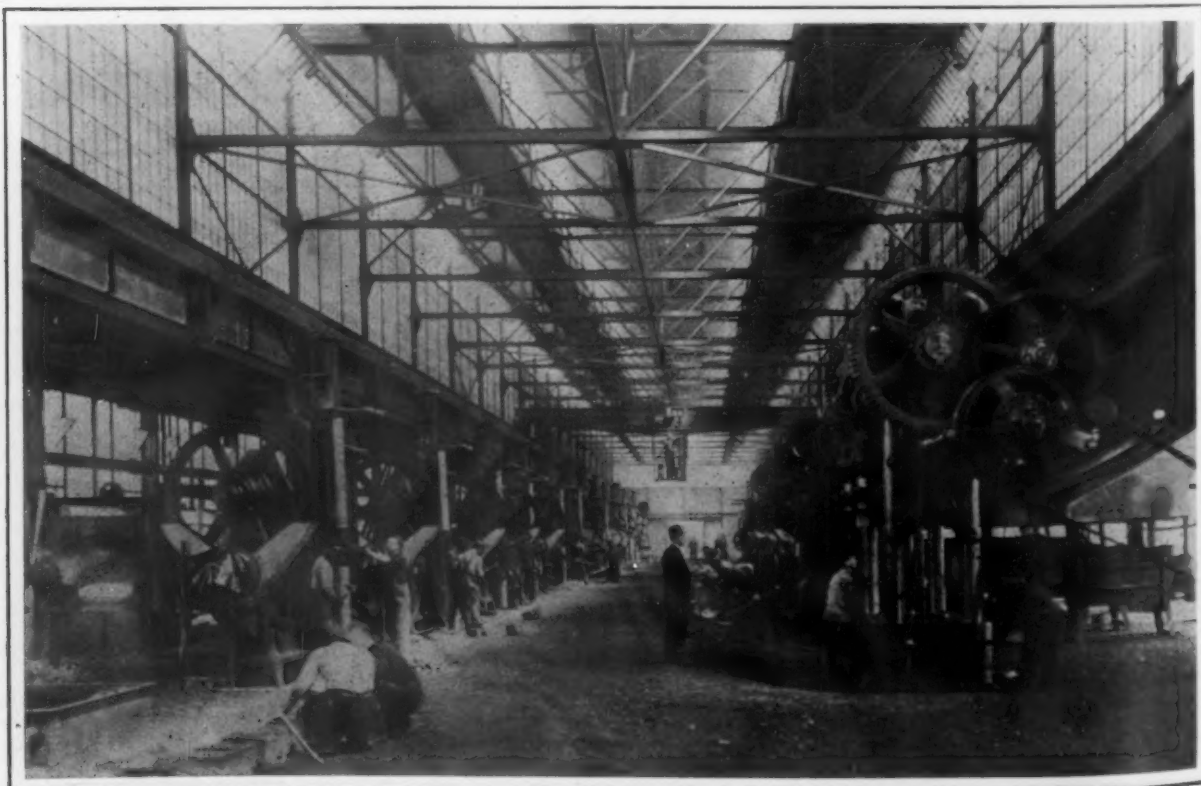


Fig. 4—General View in the Forge Shop Showing the Center Bay with Steam Hammers on the Left, the Board Drop Hammers on the Right and the 1000-ton Press in the Foreground. The Hoods Over the Furnaces Protect the Belting by Which the Hammers are Driven



Fig. 6—Connecting Rod Twisted Cold Following Heat Treatment

ments of a hammer shop. The essential consideration was the determination of the proper width of the shop. This was established by a trying-out process, first of the required distance between the side-walls and heating furnaces, then of the space between furnaces and hammers necessary for the convenient and efficient handling of the heated stock, then of an ample width for the central passageway to provide for an unobstructed aisle through which men could pass and material could be handled without interference from the operation of the hammers on either side, and in like manner across the entire floor space to the opposite wall. The result was a width of 72 ft. overall.

The provisions for lighting and ventilating are striking features of the building. The roof over the center bay is a double monitor with all sides in full glass and with ventilating panels operated by the Pond continuous system, extending the full length of both large and small monitors. These monitors are required only to handle the smoke and heat from the hammers as the roof over the side bays, in which the heating furnaces are located, is designed with the slope reversed as shown in Figs. 2 and 3. Instead of being deflected inward the rising air in the side bays is thus diverted outward through the continuous louvers for which the roof arrangement provides. These fixed ventilators extend the entire length of the building but at the same time do not encroach upon the ample side-wall lighting panel above the row of side entrances. By means of these entrances practically the entire side of the building is thrown open. The protecting doors are hinged

so that they may be folded up vertically in jackknife fashion as indicated in the general view of the building in Fig. 2, which manner of hanging the door leaves the passage open in adverse weather conditions, yet protected. The artificial illumination is obtained from Cooper-Hewitt mercury arc lamps hung high in the center bay. This is also one of the few forge shops equipped with a general service crane, the center bay being spanned by a 10-ton Northern crane which is in constant use for the transferring of materials along the main aisle between the two rows of hammers.

The steam hammer equipment includes two of 4000 lb., two of 3500 lb., three of 3000 lb., four of 2500 lb. and five of 2000 lb. In addition to these hammers there are eight board drop hammers, including one rated at 2000 lb., three at 1500 lb., two at 1000 lb., one at 800 lb. and one at 600 lb. The steam main carrying the steam for the hammers



Fig. 8—View of the Case Hardening Furnaces. The White and Red Signal Lamps are Shown at the Right

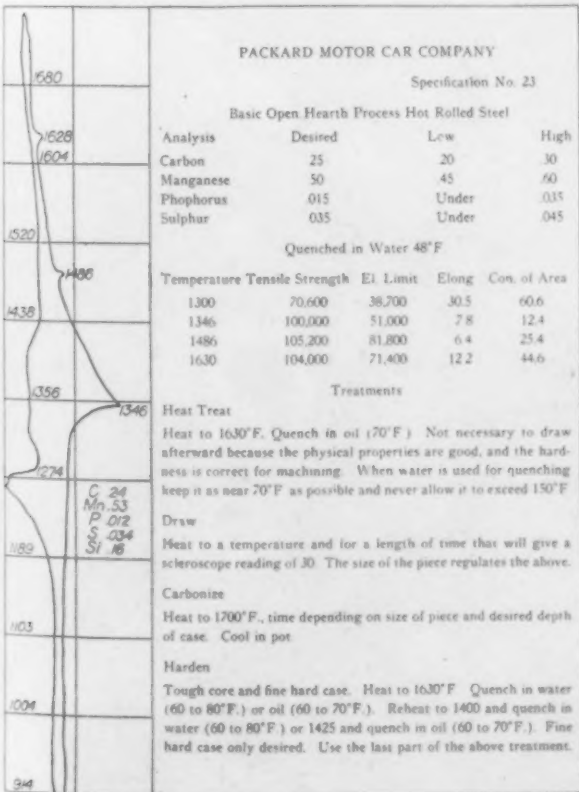


Fig. 7—Sample Curve of Critical Temperatures and Specification in that Connection

is brought through a tunnel from the boiler house to the forge shop and then in a floor conduit along the row of hammers so that the lead to each hammer is made without overhead piping. The same arrangement applies to air and water piping and electrical leads so that all interference with general lighting is eliminated. The board drops are belt driven, the belts being protected from the heat of the furnaces over which they are hung by the large metal hoods shown in Fig. 4.

The steam hammers were built by Niles Bement Pond Company and the board drops by E. W. Bliss Company. The trimming presses were furnished also by the E. W. Bliss Company and are geared to individual motors. For heavy forming work such as the front axle job illustrated in Figs. 4 and 5 two Ferracute presses are installed, one of 1000 tons and one of 500 tons capacity. Fig. 5 shows one of the steps in the forging of a 5-ton truck front axle from 4½ x 4½-in. billets.

The west end of the building is arranged with first and second floors, the ground floor serving as a stock room, shipping room and cold trimming department. The die making shop is installed on the floor above. The profiling equipment includes one of the new type Pratt & Whitney combined No. 2 and No. 3 profilers, six No. 3 Becker, three No. 2 and two No. 6 Becker machines and one No. 5 Brown & Sharpe machines. The planer and shaper tools correspond in number and size.

Liberal attention has also been given to the handling

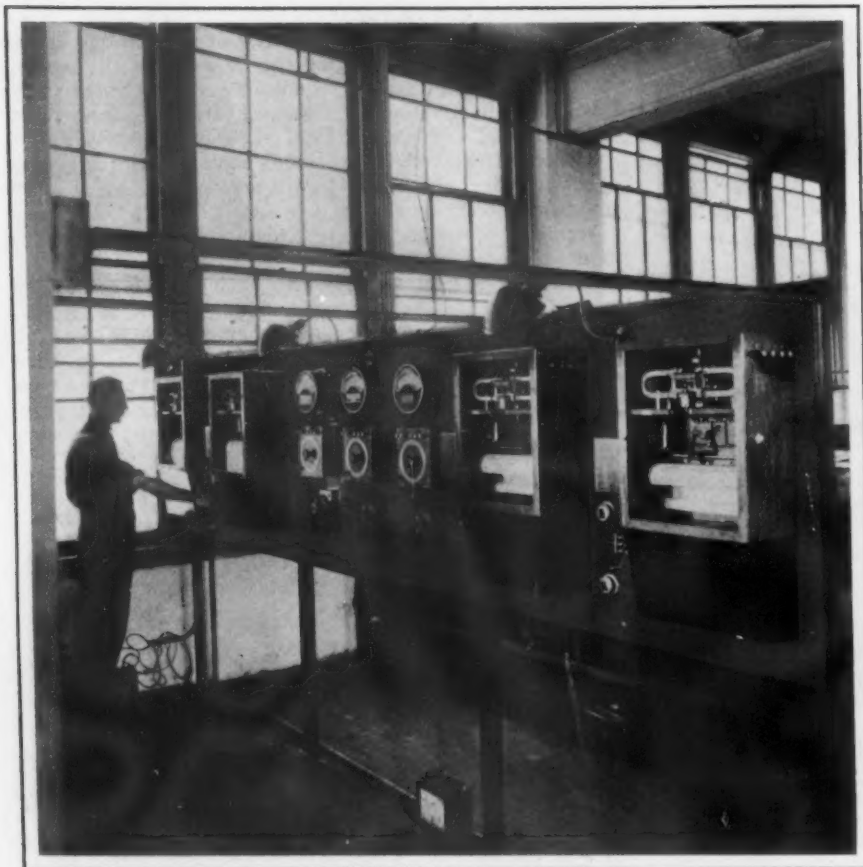


Fig. 9—Indicator and Recording Board from Which the Furnace Control is Handled, Operator in Constant Attendance

of raw stock for the forge department. Adjoining the hammer shop is a stock shed, equipped with an electric overhead traveling crane and arranged with respect to incoming trackage so that the billets, bars or other materials

used; 3, the development and perfection of temperature registering instruments, to record actual temperatures in the furnaces; 4, the selection of design and arrangement of furnaces to yield proper and most efficient results. Fig. 6

can be unloaded directly to the shears and saws for cutting to proper lengths. An industrial track connects this storage shed with the forge shop where the material is transferred from the industrial trucks by crane to the heating furnaces.

The attention given to the forging department here is in keeping with the emphasis now being placed upon this detail of motor car construction very generally and in the heat treating of the forgings is especially pronounced. Unfortunately heat treatment of steel is not a thing apparent, like the upholstery or body finish, and the sincerity with which intelligent metallurgical treatment is incorporated into car construction suffers accordingly. It is therefore the more satisfactory to find a practice in which definite principles, scientifically conceived and proved in service are adhered to rigidly and with understanding. That the methods of treatment may here differ in detail from others administered with equal sincerity is a matter of less moment. In the Packard heat treating work, effort has been concentrated upon four things: 1, insistence that the steel used shall conform to analysis specification; 2, the accurate determination of the critical temperatures of all the steel

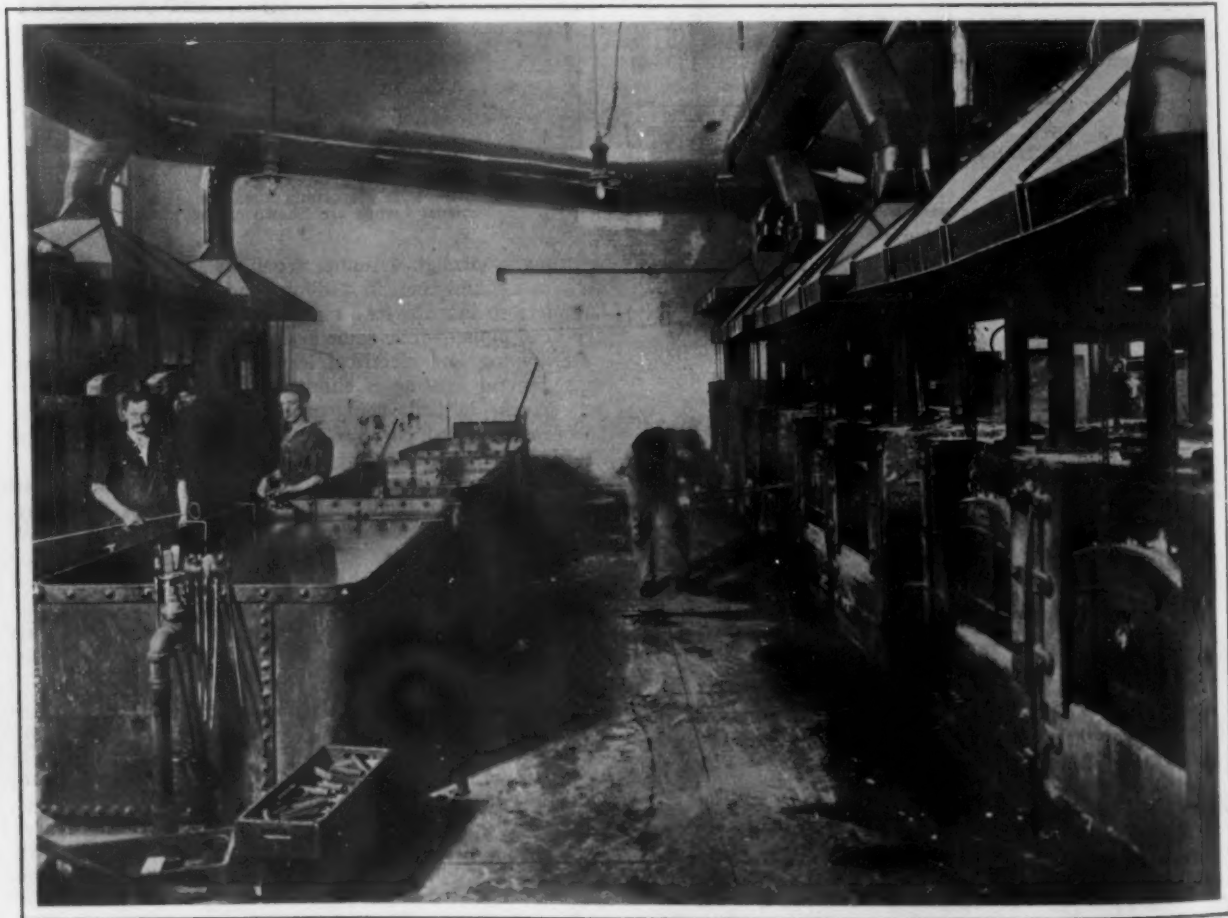


Fig 10—Some of the Carbonizing Furnaces in the Packard Plant

indicates what may be accomplished following heat treatment—the twisting and bending to which a forging may be subjected while cold without failure of the steel structure or breakage.

The choice of carbon or alloy steel to be used varies within comparatively wide limits among automobile builders and is made largely upon the basis of individual experience. The essential is that after treatment the steel shall come up to the requirements under certain conditions. In order that these results may be obtained with dependable consistency, it is primarily desirable that the steel run as nearly uniform in analysis as possible, and to this end exceedingly narrow limits of variance are prescribed.

The second consideration, involving the critical temperature of the steel used, is obviously a vital one. For the determination of these temperatures an apparatus developed by Leeds & Northrup, Philadelphia, is used. The sample of steel is inserted in a pure nickel plug and electrically connected by two porcelain insulated leads, one to

the hot end of the electrical pile in the furnace with a galvanometer connected across these two resistances. The dial, graduated in degrees of temperature, is arranged to correspond to the adjustment of the board resistance so that the temperature reading on this resistance dial registers the furnace temperature when the galvanometer needle is at zero. The troublesome cold ends which ordinarily require constant attention are thus eliminated and with this type of pyrometer any amount of current can be put through the instruments and delicate instruments are avoided.

In addition to this provision for obtaining a temperature at any given time the board has mounted on it also, as indicated in the illustration, continuous recording instruments for charting the temperatures throughout the day. One operator is in continuous attendance at this board to make the readings for all of the furnaces, thus reducing the personal equation which enters into the readings to a constant quantity for all of the furnaces. He has before him the schedule of temperatures and time for each job and fur-



Fig. 11—View Along the Front of the Battery of Heat Treating Furnaces. The Quenching Tanks are Set in the Floor

a potentiometer and the other a reflecting galvanometer. From the potentiometer reading the temperature is obtained; and from the galvanometer deflection the differential reading between the constant nickel and the test piece of steel is ascertained. This deflection is magnified on a horizontal scale by reflection through a long radius. From these two readings the curve shown in Fig. 7 is then plotted. The curve on the right is the curve of ascending temperatures and the important one. The three critical temperatures, the first at 1346 deg., the second at 1486 deg. and the third at 1628 deg., are at once conspicuous. This graphic representation of the characteristics of the steel makes the schedule of heat treatment for obtaining any desired results equally apparent. A typical heat treatment schedule for the steel, the characteristic curve of which is shown, is included in the chart, Fig. 7, and is self explanatory.

Having determined the heats to be applied and their sequence, equal attention has been given to the means for recording the temperatures accurately. In Fig. 8 is shown one of the lead bath hardening furnaces.

Instead of depending on the readings of the more commonly used thermo-couple, connected in the usual manner for the determination of the temperature of the bath, a resistance type of pyrometer, made by the Leeds & Northrup Company, has been adopted. In general terms this device is equivalent to a variable resistance on the central board shown in Fig. 9, balanced against the resistance of

nance and he is continually checking up the actual temperatures in the several furnaces. As shown in Fig. 8 there are placed conspicuously at each furnace a red and white light. The lighting of these is controlled from a central board, and indicates that the adjacent furnace requires regulation or is to be shut off. To insure the light being seen the board operator rings an electric gong, upon which signal each furnace operator looks at his light.

In Fig. 10 is shown a group of furnaces in which the medium-sized parts are heat treated. And in Fig. 11 a particularly interesting arrangement of the large furnaces for heavy work is shown. These furnaces are oil fired, the combustion chamber being at the side, and the flame being deflected over an arch into the heating chamber, in a manner especially designed to produce a uniform temperature at all parts of the hearth.

These furnaces are also used for carbonizing. One of the interesting details of the practice here relates to the experimentation with carbonizing compounds and with packing boxes. As the result of the experiments made, the more or less common carbonizing material, raw bone, was discarded and a compound adopted which is used three times before being considered worthless, the penetration being uniform with the second and third usage. The frequency with which common gray iron packing boxes crack when subjected repeatedly to temperatures of 1500 to 1800 deg. was a constant source of trouble. Steel castings while giving better results were expensive. The use of a

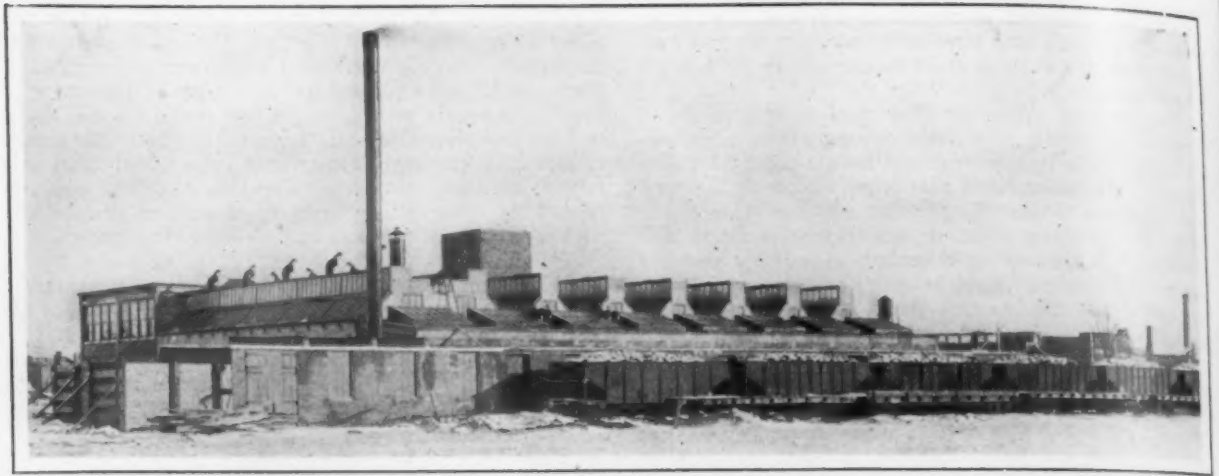


Fig. 12—Exterior View of the Foundry Building Showing an Interesting Type of Roof in which Saw-tooth and Monitor Roof are Combined

hard white iron box solved the difficulty, the casting becoming malleablized with use by the same process which carbonizes the steel. These boxes develop no cracks, have a much longer life than gray iron boxes and are no more expensive.

Unusual attention has also been given in this heat treating plant to the matter of quenching. It has been shown to be of utmost importance in the obtaining of uniform physical properties that not only the heating of the steel shall be known and that the distribution of heat throughout the piece shall be uniform, but also that the temperature of the liquid in which the successive portions of any lot of pieces for which identical properties are desired are cooled shall be maintained constant. This is almost impossible without artificial means for cooling and ample storage. For this purpose a refrigerating plant built by the Frick Company, Waynesboro, Pa., is installed with capacity sufficient to maintain 10,000 gal. of oil at a temperature

between 60 and 70 deg. The cooling system also includes a nest of pipes placed on the roof of the building through which the oil passes during the winter season.

As shown in Fig. 11 the quenching tanks are set into the floor, the bottom of the tank protruding into the basement below, where all of the pipe connections are made. The handling of the steel into and out of the tanks is thus made easier.

Like the forge shop, the foundry also presents some unusual construction details. A general view of the exterior is shown in Fig. 12, from which view the roof arrangement, combining the sawtooth and monitor ideas, is most clearly apparent. An interior view showing the roof construction and the proportion of light panels together with the Drouvè operating mechanism for ventilation is illustrated in Fig. 14. The roof arrangement is an adaptation of the roof design of the foundry of the Brown & Sharpe Mfg. Company, Providence. Flaming arcs are used for ar-



Fig. 13—Passageway which Parallels the Foundry and Into which the Storage Bins for Sand, Stone and Other Material Open. Unusual Attention has Been Paid to the Construction and Lighting of this Part of the Foundry



Fig. 14—View of One of the Core-Room Benches and a Core Molding Machine, Showing Also the Roof Construction

tificial illumination. The roof trusses of structural steel are supported on round cast-iron columns. An unusually careful treatment has been given to the arrangement of that part of the foundry in which the raw materials are handled. Fig. 13 not only calls attention to the style of concrete construction used throughout the foundry but illustrates the long covered areaway well lighted by roof panels into which the various sand, coke and stone bins open. The exterior view of this raw materials storage leanto with the cars of incoming material, is shown in the foreground of Fig. 12.

The foundry work includes both gray iron and aluminum casting and also a small brass foundry. The most important part of the gray iron work is the cylinder castings. These molds are made up on machines during the forepart of the day and in the afternoon are placed in the ovens to dry for 24 hr. The dried cores and molds from the previous day are then brought out on the floor and made up in three part flasks as shown in Fig. 16, and are poured and shaken out the last thing at night. The cores are all set by gauge. The molding machine equipment includes thirteen 22 x 18 x 8-in. rockover machines and seven



Fig. 15—Oven Equipment for Handling the Cylinder Dry Sand Cores

S. DIESCHER & SONS.
Mechanical and Civil Engineers,
PITTSBURGH, PA.

16 x 16-in. heavy double shaft machines, manufactured by Henry E. Pridmore. A view of the cores in the oven rack is shown in Fig. 15. The foundry, core room and brass foundry floors are made continuous with no separating partitions. It is thus possible to accommodate the floor



Fig. 16—View Showing the Pouring of the Cylinder Molds which Are Made Up in Three Part Iron Flasks

space to the requirements of each department with the greatest flexibility and also contributes to the easy and rapid handling of materials. A portion of the core room and one of three 16 x 14 x 5 in.-Pridmore rockover drop core molding machines is shown in Fig. 14. There are two No. 60 Newton cupolas.

Amalgamated Scales Not Yet Settled

On Tuesday and Wednesday, May 27 and 28, a conference was held at Detroit, Mich., between the wage committee of the Amalgamated Association and James H. Nutt, commissioner, representing the Western Bar Iron Association. No agreement was reached. It is stated that the Amalgamated Association does not expect the manufacturers to grant the advance of 15 per cent asked in behalf of finishers, but will insist on the advance of 50c. a ton for boiling. It was decided to hold another meeting at West Baden, Ind., commencing Tuesday, June 10.

A meeting between the wage committee for sheet and tin plate mills of the Amalgamated Association and a number of the independent manufacturers of sheets and tin plate was held in the Fort Pitt Hotel, Pittsburgh, on Thursday, May 29. The new scales proposed for these mills do not call for any particular advances for high priced labor, most of the advances being on the lower paid men. The manufacturers strongly oppose any advance at this time, contending that the business outlook is uncertain, but they would probably be willing to continue the present rates for the year beginning July 1. No agreement was reached, and it was decided to have another meeting at West Baden, Ind., on Monday, June 16.

The fact that no settlement has been reached on any of the wage scales does not indicate that there will be labor troubles this year in the mills controlled by the Amalgamated Association. On the contrary, it is strongly asserted that satisfactory settlements of all the scales are likely to be reached before the present scales expire on June 30.

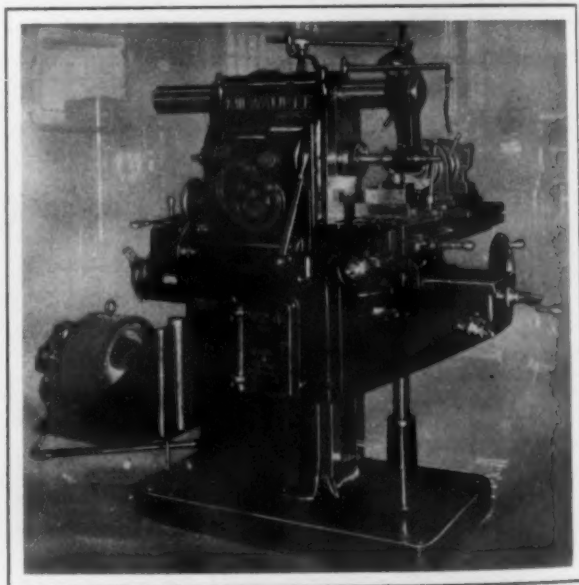
The Laclede Steel Company, St. Louis, Mo., manufacturer of rail-carbon steel bars for reinforcing work, also angles and agricultural shapes, announces the appointment of Theodore Geissmann & Co., Inc., 72 West Adams street, Chicago, Ill., as its authorized district sales agent in the Central West, for the distribution of its products.

A Constant-Speed Milling Machine

The Kearney & Trecker Company, Milwaukee, Wis., is building a milling machine with constant-speed motor drive, which is especially designed for heavy duty and fast cutting. Automatic lubrication is provided for the gears and bearings and also the milling cutters.

The driving shafts and gears are made of case hardened steel and the knee is of box section and is closed on the top, an arrangement, which it is emphasized, adds to the power and rigidity of the machine. The work table projects beyond the bearings and protects them from dirt and chips by this construction. A solid steel bar to which the arbor supports are clamped extends parallel with the spindle and forms the over arm. The arm braces serve to form a tie between the arm and the knee and help to prevent them from springing in opposite directions. The spindle is made from a steel forging and runs in tapered bronze bearings. A self-contained reversing mechanism is provided for the spindle, so that right or left hand cutters can be used. The column is a heavy and massive one-piece casting, reinforced by internal ribs, the weight being sufficient to render masonry foundations unnecessary where the floor possesses sufficient strength to support the load.

The machine is driven by a 5-hp. Westinghouse electric motor, which is mounted on an adjustable bracket, and the power is transmitted through a pair of reduction gears, which are mounted inside the



A Motor-Driven Constant-Speed Milling Machine Designed for Heavy Duty and Fast Cutting

machine. A constant-speed drive was adopted for this type of machine, since the pull at the periphery of the cutter is the same at any given surface speed, irrespective of the cutter diameter.

The gears and bearings are automatically lubricated, the supply of oil being forced up by a pump from the base. Another pump supplies the lubricant to the cutters and the used oil flows back by gravity to the reservoir in the base from the work table.

The promise made by President Charles C. Moore of the Panama-Pacific International Exposition, San Francisco, that all exhibit palaces will be under construction by July, is being kept by the Building and Grounds Committee. Several contracts were let in May.

A New 20-In. Geared Head Lathe

Ability to secure any one of the 18 spindle speeds readily is one of the special features characterizing an improved 20-in. geared head lathe, which has been brought out by the F. E. Reed Company department of the Reed-Prentice Company, Worcester, Mass. The lathe spindle is controlled from the apron and in addition to making the speed changes readily available while the lathe is running, any feed within the range provided can be secured by a simple lever movement.

As will be noticed from the accompanying engraving, the lathe is of heavy construction throughout. The headstock is of the geared pattern and 18 spindle speed changes can be readily secured with 13 gears, by pulling a lever, as indicated by the speed index plate. It is pointed out that as the gears are always in mesh, it is impossible to damage them, the shock when changing speeds being taken care of by friction clutches. The gear train in the headstock is arranged to secure the greatest number of speeds obtainable with any combination of the same number of gears and the speed changing levers are arranged so that conflicting gear ratios cannot be engaged.

The lathe is equipped with a spindle reversing mechanism, located in the headstock and consisting of spur gears and a double friction clutch. These gears are not employed to drive the lathe while work is being done, but are

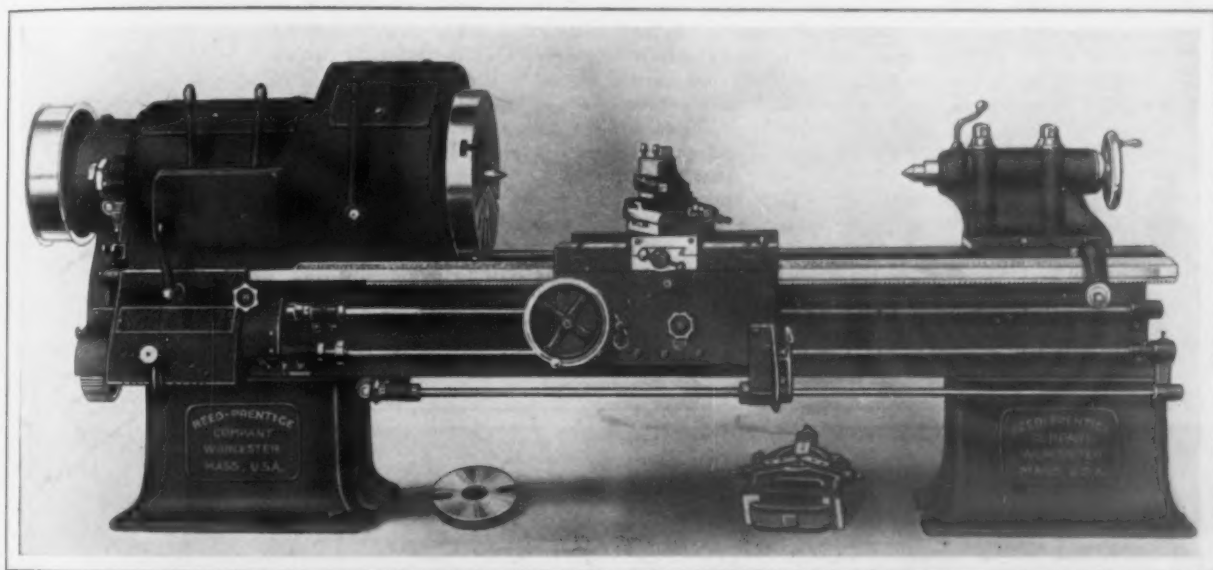
while the feeds are engaged, thus making it impossible to engage the lead screw and the feed rod at the same time.

The lathe is driven by a large-diameter single pulley, having a wide face and running on ball bearings. This pulley runs at a constant speed of between 400 and 500 r.p.m. and thus constant power at any speed of the spindle is given at the tool. If desired, the lathe can be arranged for motor drive and equipped with a motor.

Oneida Community Enlarges Its Plant

The Oneida Community, Ltd., Oneida, N. Y., is erecting an entirely new fireproof building for the use of its tableware department at Sherrill, N. Y., on plans by William Pierson Field, engineer, 763 Broad street, Newark, N. J., who also has supervision of the construction. The structural steel work is being done by the American Bridge Company. The building is T-shaped, 158 x 296 ft., with a uniform width across the bar and stem of 57 ft., of three full stories, each 12 ft. clear. The floor slabs are of reinforced concrete, with expanded metal. The exterior of the building will be brick veneer over concrete fireproofing. All sash and frames are to be of metal with wire glass.

The first two stories will be used for storage and heavy machinery, the entire upper floor being devoted to the plating and finishing rooms. The plating room will be



An Improved 20-In. Geared Head Lathe in Which a Large Number of Speed Changes Are Secured Through a Comparatively Small Number of Gears

used only to reverse the spindle. The mechanism is connected to the apron and enables the operator to start, stop and reverse the spindle from his natural position by a lever which travels with the carriage. It is emphasized that this control is highly sensitive, thus enabling the operator to start, stop or reverse the spindle instantly. The friction clutch employed is of a special patented type to make the changing of speeds quickly and safely while the lathe is running and under load possible.

The apron and rest are of heavy construction. The latter is securely gibbed to the bed and has long bearings at each end of the rest in front, directly under the tool block on the inside and for the entire length of the rest on the outside of the bed in the back. It has four screws in the swivel block, two on each side. The reverse lever at the front of the apron moves a double bevel pinion and can be set for feeding in either direction or in the neutral position, which will stop all gearing in the apron. Graduated dials, reading in thousandths of an inch are furnished on both cross feed and compound rest screws.

The lathe is equipped with a quick change gear mechanism, giving 60 changes to both the lead screw and the feed rod. All of the gears in the front box are made of steel. The lead screw is cut from a special grade of steel and the feed rod drives the apron mechanism, thus reversing the lead screw exclusively for thread cutting. An automatic locking device connected with the reverse lever prevents the half nuts from engaging with the lead screw

without columns, 55 x 155 ft. The clear space is provided by means of steel trusses spanning the entire width of the head of the T, and this section will have a sloping roof which will be surmounted with a large electric sign. The remainder of the building will have a flat roof surrounded by a parapet. The plans provide for fireproof stair cases in exterior towers and for two service elevators. The heating will be taken care of by means of direct steam and some forced fan ventilators will be provided. The best of plumbing and interior equipment will be provided throughout. The building will be ready for occupancy about January 1. All inquiries with reference to contracts, supplying of materials, etc., should be addressed to the engineer or Griffiths & Pierce, general contractors, Utica.

Low grade iron ore and mine refuse will henceforth be used exclusively for the permanent improvement of highways, under State aid, in Ashland County, Wis. The county board of supervisors has abrogated its contract for the crushed stone supply. It is believed that ore will be generally used for road building, thus relieving the mines in northern Wisconsin of a problem of the utilization of waste.

The Otis Elevator Company of Missouri will have its main office in the new two-story building in St. Louis, recently mentioned in these columns as in course of erection for repair and warehouse purposes.

Making Pressed Steel Pipe Unions

Radical Innovations in Material and Processes—Cold Drawing from Strip Stock—Large Individual Motor Drive Presses

A pressed steel pipe union has been perfected and is being manufactured by the Mark Mfg. Company, Chicago. It is made in sizes from $\frac{1}{2}$ in. up to 3 in. and is adapted to all pressures up to the heaviest hydraulic requirements for pipes of the sizes indicated. These unions are made in steel and brass and are cold drawn from flat strips.

Contrasted with the unions available heretofore, the parts of which are cast either in iron or brass, this new type constitutes a radical innovation in the materials used and the method of manufacture. In the details of its design and in its inherent properties differences also obtain from which are secured, it is claimed, various advantages previously lacking. The use of dead soft brass or box annealed steel, such as is obtainable in strip form for stamping purposes, secures for a union made in this way a continuity of metal structure and a freedom from imperfections such as it is not always possible to obtain in castings.

Equally important in the maintenance of tight joints is the fact that with the union made as this one is, of the same material as the pipe which it connects, the expansion of the union is always the same as that of the pipe. In contrast, the expansion of the hot steel pipe on a steam line where the union is a malleable casting, produces a permanent set in the malleable union, the natural expansion of which is not so great, with the result that when the pipe cools a tight joint no longer exists and a leak follows. Tightening up the union in that case affords a temporary cure, but the above process is repeated with the next heating of the pipe and obviously the limit to which the union may be strained by this re-tightening is soon reached, requiring its replacement. Conversely, brass unions when hot will expand more rapidly than the steel pipe and are likely to leak accordingly.

With the Mark union, possibility of leakage is also reduced by the fact that this union is threaded to Briggs standard for pipe threads, so that the union can be drawn up on the thread taper to a tighter joint than is possible with the ordinary union commonly tapped straight through. Tests have demonstrated that the strength of this union, arising out of the superior material from which it is made, is sufficient to crush the end of the wrought pipe when pulled up on the taper thread—a test which would result ordinarily in the bursting of the threaded ends of a cast union.

The efficiency of this union is indicated in its design, which is unchanged, except for increased weight of metal, throughout the entire range of sizes even to the heaviest pressure requirements, for which service in cast unions special designs have been found necessary. In Fig. 4 are shown the three parts of the union including the male and female ends and coupling nut and a cross-section. From the cross-section it will be noticed that the seat of the joint is in accordance with more recent practice and consists of a brass ring inserted in the female end of the union. This is also cold drawn from flat stock and subsequently annealed.

The operations involved in making all three parts of the union are somewhat similar and except for threading, involve no machine cutting. They are indicated in Fig. 3. The first piece shows the disk which is stamped from the strip, and the second piece the manner in which this disk is cupped and punched out at the end in the same press. This press is shown in Fig. 1 and is of the double-acting toggle drawing press type with capacity adapted to the drawing of deep shells in plate up to and including $\frac{5}{16}$ in. One end of the piece is then rolled back on itself to be subsequently pressed into finished form for the lip. The opposite end is also upset in

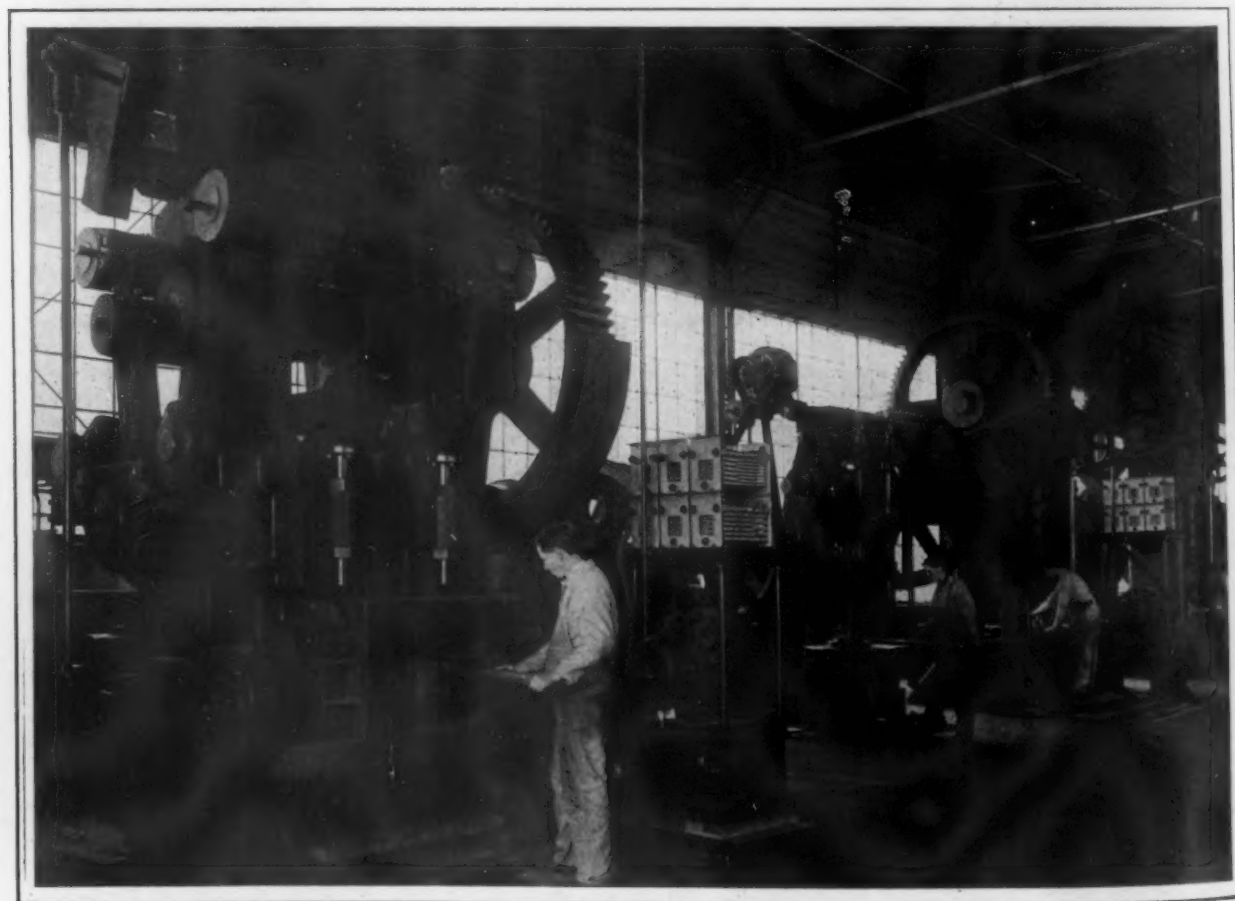


Fig. 1.—View in the Shop of the Mark Mfg. Company Showing One of the Heavy Double-Acting Toggle Drawing Presses on Which the Parts of the Union Are Stamped from Strip Steel and Cupped

preparation for threading. The coupling nut is rolled back and formed in hexagonal shape suitable for the application of a wrench. The compression of the lip end of the male part of the coupling for the seat bearing involves an exceptionally heavy pressure which gives to the steel a dense hard structure and a true, polished surface. The press on which this operation is finished is shown in Fig. 2.

For rust-proofing the union, the parts are sherardized, a process which develops its real effectiveness where the metal treated has a clean surface and uniform structure as compared with silicated castings.

To insure the commercial and competitive possibilities of the union, the Mark Mfg. Company has built and equipped an exclusive plant for its manufacture. The main building is 75 x 200 ft. with a wing 70 x 150 ft. and is of steel framework with the side walls almost entirely of steel sash lighting panels. The type of special press equipment, built and installed by the Toledo Machine & Tool Company, is indicated in Figs. 1 and 2, all of the presses having individual driving motors. For handling the material into the presses semi-automatic feeds have been provided and following the machine operation the piece will be mechanically conveyed to the following



Fig. 4—The Three Parts of a Union and a Cross-Section. In the Last View the Brass Seat is Readily Seen

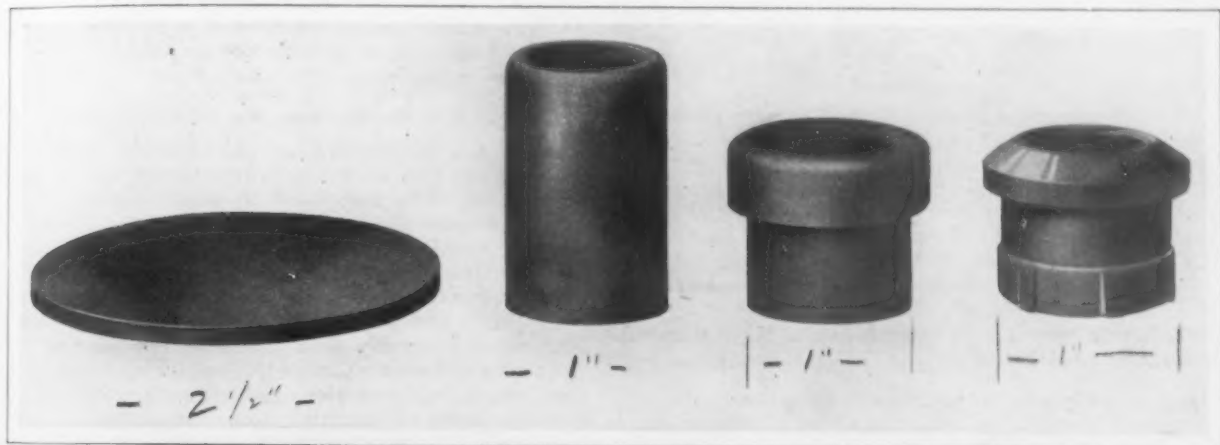


Fig. 3—View Showing Successive Operations in Drawing the Male Part of the Union

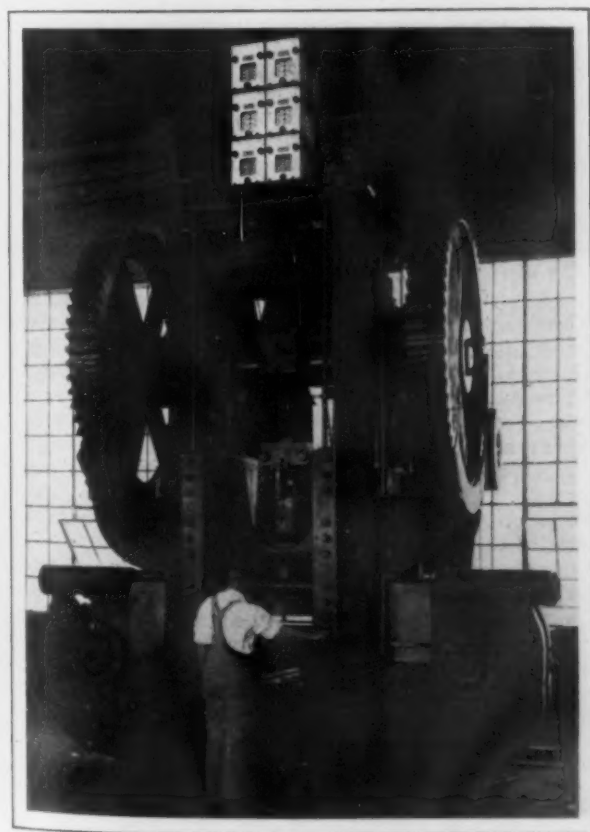


Fig. 2—The Straight Sided Double Gear Press on Which the Metal Flange is Pressed Into Its Finished Form

operation. Creosoted wood block flooring, furnished by the Ayer & Lord Tie Company, Chicago, has been laid as the result of the comparative service rendered by this type of flooring as compared with the various other kinds of flooring tried in this company's pipe mill including dirt, plank, brick and concrete.

United Metal Trades Association Officers

District officers of the United Metal Trades Association of the Pacific coast have been elected as follows:

Oregon district, office in Portland: Chairman, H. D. Harris, Harris Ice Machine Company; vice-chairman, Fred Hesse, Hesse-Martin Iron Works; treasurer, H. T. Clarke, Portland Iron Works.

Washington district, office in Seattle: Chairman, L. H. Roe, Westerman Iron Works; vice-chairman, A. N. Walstad, Walstad Machine & Electric Company; treasurer, J. J. Hendricks, Hendricks Mfg. Company.

Inland Empire district, office in Spokane: Chairman, Stanley Mayall, Armstrong Machinery Company; vice-chairman, Fred Ehlers, Pacific Iron Works; treasurer, B. B. Truett, Hallidie Company.

The officers of the district and of the general association constitute the Executive Council for this year. The general association officers are: President, A. G. Labbe, Willamette Iron & Steel Works; first vice-president, F. G. Frink, Washington Iron Works; second vice-president, J. M. Fitzpatrick, Union Iron Works; third vice-president, Eugene Roberts, Puget Sound Iron & Steel Works; treasurer, A. M. Clark, Columbia Steel Company.

A boycott of the Panama-Pacific Exposition is the retaliation Germany now threatens us if its protests against certain features of the tariff bill are not heeded.

The Corrosion of Cast Iron Reviewed

Its Nature and Causes and the Practice
to Secure Resistance to Destruction

—BY RICHARD H. GAINES*

Generally speaking, cast iron resists corrosion better than any other form of iron or steel, the close-grained iron being less acted on than the more open-grained varieties. Why some cast irons corrode much faster than others when subjected to the same conditions, how the corrosion can be minimized and the influences which promote this trouble, are all questions of vital interest.

The Nature of the Corrosion

Unfortunately, more than any other metal, iron is subject to deterioration by oxidizing, the effects of which are much aggravated by the fact that the oxide formed lacks the property of adherence which, in the case of other metals, limits oxidation to a mere superficial action the oxide itself forming a protective coating for the interior of the mass.

The precise influences which operate and the changes which occur when iron rusts have formed the subject of a number of scientific investigations, but it cannot be said that any final agreement as to their exact nature has yet been arrived at. The electrolytic theory of corrosion is now provisionally accepted by most authorities on the subject.

The two essential factors which determine the corrosion of iron in water and in aqueous solutions are the presence of water in its liquid state and of oxygen. It is well established that no rusting takes place either in air free from moisture or in water free from air. While it has been proved that carbon dioxide is not essential to the process as formerly held, it may be stated that any acidity increases the rapidity with which corrosion takes place, and the presence of alkaline substances, such as lime, inhibit rusting. The latter fact is of the utmost importance with the use of iron and steel in concrete.

Influences Which Promote Corrosion

Dr. H. M. Howe says: "Electrolytic action surely hastens corrosion very greatly, and in practice it may well be true that nearly the whole of corrosion is electrolytic." The writer has always believed that the only corrosion of iron that proves destructive, save that due to stray electric currents, is due to differences of solution pressure at different parts of the metal. The subsidiary constituents of iron and the presence of rust films or even protective coatings, where flaws arise in them, act energetically in promoting decay. When two different substances are separated at one point by a liquid in which one of them is soluble, and are connected at some other point, an electric circuit is formed similar to that produced when the poles of an electric cell are connected. The electric energy is derived from the solution of the material; that is, from chemical action which would otherwise result in evolution of heat. Such electrolytic action invariably manifests itself when moisture, impregnated with acids from the atmosphere or salts in solution, obtain access to two different constituents of iron, and can even take place between iron and rust, or between iron and paint, if the latter is so far deprived of its oily covering as to become a conductor. Cast iron, for example, with its insoluble graphite and relatively soluble ferrite, affords a typical medium for such action in water or any electrolytic solution.

Again, when iron is in contact with another metal, a similar action may take place. It does not follow that the iron will in all cases be the material which is dissolved in electrolytic actions, but in all ordinary cases except when zinc is the metal in contact with it, it is the iron which suffers solution.

Influence of Contact Between Iron and Other Metals

The following law applies:

a—When iron is in contact with one of the less noble metals (more electropositive, as zinc, for instance) in the series of contact potential differences and both metals are placed in aqueous solutions producing corrosion, the cor-

rosion of the iron decreases while that of the other metal is accelerated, and,

b—When iron is in contact with a nobler metal (more electronegative, as copper) in the same series, in similar conditions, the corrosion of the iron is largely increased.

For the production of the effects under *a* and *b* it is unnecessary that there should be sufficient potential difference between the two metals placed in the liquid to lead to a visible decomposition of the water, since the effect is observable at even a very low potential difference, though it naturally increases as this rises.

According to Professors Heyn and Bauer, of Gross Lichterfelde, the contact of iron with copper increases corrosion on an average by 25 per cent. in the case of town water supply, the corresponding figure being 47 per cent. in artificially prepared sea water. By special experiments it was proved that the decomposition of water plays no part in the reaction. The effect of the copper is that it causes the oxygen in the water to act more energetically upon the iron electrode than when there is no copper in contact with the iron. Where there is no oxygen in solution, the iron even when in contact with copper is not attacked.

Tests showed that iron in contact with nickel, placed in water, corrodes about 15 per cent. more than when not in contact with nickel.

Tests showed that cast iron does protect steels. Corrosion of the latter is decreased by 50 per cent. when air is allowed free access to the water surface.

Contacts Between Specimens Cut from the Same Bar

Heyn and Bauer found that two specimens taken from the same iron, but worked up differently (by rolling, forging, heating, etc.) and placed in water in contact with each other generally show an electric potential difference, and this would tend to prove that they have an influence one upon the other in the matter of corrosion; the iron which happens to be in a less noble state is attacked more energetically and protects the more noble one. Such influences are commonly undervalued by technical men.

It must suffice in a paper of this scope merely to mention some of the corrosive agencies without undertaking to treat them all separately. Iron always corrodes most readily when subjected to the alternate action of wet and dry. Several factors contribute to this, the most important of which is that at its surface in contact with ordinary atmosphere water is saturated with oxygen and its corrosive powers are consequently at a maximum. Around the water line of bridge columns and other structural work the engineer and painter must therefore give particular heed.

Effect of Sea Water

Unprotected cast iron, if long exposed to sea water, undergoes complete disintegration, the iron is dissolved away and a soft, spongy mass of graphite, carbide of iron and other substances is left. Under the influence of electrolytic action the electronegative carbon is left, while the electropositive iron is dissolved. When cast iron is exposed for long periods of time to the continuous action of sea water, more or less in the complete absence of air, as, for example, at considerable depths below the surface of the sea, it undergoes oxidation to ferrous oxide, becoming extremely soft, although at the same time it may retain its original shape. The carbon content of the metal is usually thrown out as a graphitic mass throughout the pores of which the ferrous oxide is lodged. The specific gravity of this material is only about one-sixth of that of the original metal.

A classical instance of the corrosion of cast iron in sea water is given by the Swedish chemist, Berzelius. Cannon balls raised at Karlskrona from a ship which had been sunk for 50 years showed that the metal had been entirely converted into a porous graphitic mass, which spontaneously heated when exposed to the air. Many other specific examples of the destructive action of sea water could be cited. Experiments have demonstrated, however, that cast iron is much more resistant than steel or wrought iron to corrosion in foul water and in sea water, while there is little difference in fresh water.

Blast furnaces in different localities produce different qualities of pig iron, according to the ore and fuel available. Also the chemical composition of the iron from

*Chemist, Board of Water Supply, New York.

any given furnace varies within certain ranges according to the contingencies of smelting. These facts must be borne in mind if corrosion is to be minimized by the use of high quality cast iron. In considering this phase of the subject it is important to remember that iron is a metal which readily combines with or dissolves nearly all the other elements. It is also unique in the fact that very small quantities of impurities suffice to change entirely its physical characteristics.

The proper control of unavoidable impurities, their homogeneous distribution and careful furnace treatment, are precautions that will improve the rust-resistant quality of cast iron. If the metal is left with the "skin" as it comes from the mold it is less easily corroded than that which has been machined. When the iron is cast in the sand there seems to take place some union between the metal and the inside surface of the mold whereby a very resisting, silicious coating or skin is formed. This outer skin acts as a preservative coating much in the same way as steel and iron are protected by the film of oxide produced by the Bower-Barff process. Cast iron protected by the natural coating of slag from the molds resists oxidation well. This is no doubt the secret of the greater resistance offered by cast-iron pipes to the destructive action of stray electric currents. The protection afforded by the silicious skin cannot be relied on indefinitely, however, and after it is worn away cast iron corrodes even more rapidly than wrought iron or steel. With the latter condition the superior thickness of cast iron is the factor favoring its greater durability.

Resistance of Cast Iron to Corrosion

At the present time it is impossible to say what constituents have the most influence on durability. The relation of the composition of cast iron to its resistance to corrosion has apparently never been systematically studied and little seems to be definitely known on the subject. Campbell and Glassford, of Columbia University, conclude from a long research on the corrosion of cast iron that increase in silicon is attended by increase of susceptibility to corrosion. It is the opinion of others that silicon is the most injurious element present, and though it may be going too far to say that every high silicon iron will fail and every low silicon iron will be successful, there is much evidence pointing to such a surmise. In any event, iron of low silicon, low phosphorus and low carbon content has proved successful to resisting corroding where irons carrying higher percentages of these elements have failed. The following analyses are given by Campbell and Glassford of an iron that successfully resisted serious corrosion for years, while another failed.

	Sound. Per cent.	Failed. Per cent.
Silicon	1.72	2.40
Sulphur	0.085	0.067
Phosphorus	0.89	0.94
Manganese	0.48	0.52
Total carbon	2.45	3.19
Combined carbon	0.17	0.25

Experience has shown that iron having the greatest density will invariably be found best to withstand the ordinary influences of corrosion. In order to obtain dense, close-grain iron, such as is believed to be most resistant to corrosion, the following suggestions are offered:

Silicon should be kept just as low as possible and still have the castings soft enough to machine, the exact percentage depending upon the thickness of the casting and the character of the mold. The silicon may range from 0.75 per cent. for heavy work up to 2 per cent. for small valves.

Combined carbon has a powerful action in closing the grain and giving a dense iron and should be just as high as possible and still have the iron machineable.

Manganese had best be kept moderately high, since it appears to have some beneficial effect in closing the grain.

Sulphur is a powerful agent in closing the grain, but may give trouble in other directions; as a general proposition, it is better to keep the sulphur low and get necessary density by a proper regulation of silicon and manganese.

Finally, one of the best means of closing the grain of cast iron and securing maximum density is by means of steel scrap in the mixture. This is now common practice

with makers of hydraulic castings and is very effective.

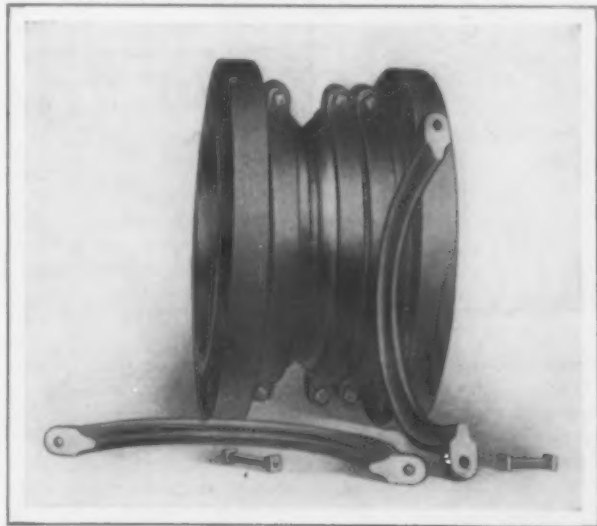
Some practical rules laid down by the American Foundrymen's Association for obtaining castings resistant to corrosion are as follows:

1. Use white iron if possible. (White irons are especially useful where any acidity is to be encountered.)
2. If not practicable to use white iron castings, chill those surfaces which are to be in contact with corrosive conditions.
3. If gray iron must be used, get dense, close-grained castings through the use of steel scrap or otherwise.
4. Avoid oxidized metal; use pig irons of good quality together with good cupola practice. If possible, use de-oxidizing agents; for example, titanium or vanadium.
5. Keep the sulphur just as low as possible.

A Copper Self-Equalizing Expansion Joint

A corrugated copper joint having external rings and which is designed to take up changes in length in pipe lines, whether they convey steam, water or air, has been brought out by the E. B. Badger & Sons Company, 63 Pitts street, Boston, Mass. The special features claimed for the joint are elasticity to withstand repeated changes of shape combined with strength to resist any pressure for which the joint is designed.

The well-known corrugated form, such as is used for furnaces of internally fired boilers was adopted, because of its strength and flexibility. A single piece of copper with corrugations would have to be very thick, it was found, for high pressures, and in actual practice, it is pointed out, that there is always a tendency for one or two corrugations to take the entire strain of repeated changes in shape, and in time these would give out. To distribute the strain among several corrugations and thus bringing many into service and not causing any particular one to take more than its share of the work, external rings on the corrugations were used. These rings force a portion of the strain to the next corrugation, and as each corrugation has but a slight movement, the joint



A New Form of Corrugated Copper Expansion Joint with External Rings

lasts, it is pointed out, almost indefinitely. Added strength is given to the joint by the external rings, just as the winding of a pipe spirally with wire adds to its strength.

The number of corrugations employed is dependent upon the pressure and upon the length of the joint. For high pressure and superheated steam the change in length is considerable, so that more corrugations are used. For very low pressures, as in exhaust steam piping, two or three corrugations are sufficient for the slight alteration in length. There are also some cases where the expansion is very little, but the vibration must be taken up and in that instance the joint does not need any external rings, although in most cases they are used for the purposes of adding strength for high pressure and also to stiffen the exhaust pipe against collapse.

Electric Steel Production and Its Expansion

A German Discussion from the Large Industry Point of View—Comparison of Acid and Basic Steels from the Heroult Furnace

W. Eilender, manager of the Richard Lindenberg Steel Company at Remscheid-Hasten, Germany, where the Heroult electric furnace has been developed into a splendid commercial success, has published an interesting discussion of electric steel production from the large industry point of view.* Assuming that the economic and qualitative superiority of electric steels in the sphere of the high-grade steels, which are not made in large tonnages, is now an established fact, the paper deals with the rise of the electric furnace in the past few years in the large steel industry. Apart from its use as a melting furnace for ferromanganese, etc., it has been employed in making different special steels such as for seamless tubes, high silicon dynamo plate, alloy steels for ship construction, bridges, etc., and for war material. The highly developed use of excess blast furnace and coke oven gas is now giving power for which an outlet is sought, so that the sphere of electric steel production is being expanded and it becomes of interest to determine the limits for this expansion.

Current Consumption Less for Large Furnaces

First the wide field of the middle qualities, such as are now made in the open hearth, is considered. At first thought it might be expected that with improved quality a certain increase in price could be obtained. In Mr. Eilender's opinion, however, with the general introduction of electric steel qualities the lively competition thereby

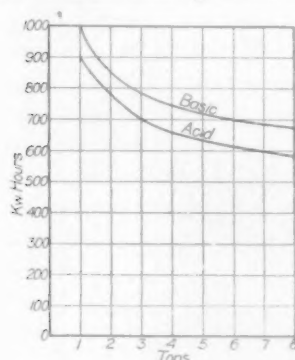


Fig. 1—Current Consumption Curves for Solid Charges

brought about will counteract this tendency. From the operating costs so far published it is evident that the combination of converter and electric furnace is very promising, and it will therefore be of great interest to determine whether, possibly by the use of larger furnace units or some special melting process, such low costs can be obtained for electrically refined material that competition will be possible with ordinary open-hearth steel. The results offered below bearing on this question have all been obtained with the Heroult furnace. There is no doubt that similar ones could be produced with other furnace systems, although it has not yet been fully determined whether large furnaces can be built in these systems that will properly meet the operating conditions necessary for large outputs. In Figs. 1 and 2 are given curves of current consumption, based on low-carbon high-grade material, and which can lay claim to reasonably general application. From the curve given for basic material and liquid charges in Fig. 2 it is readily seen how the current consumption depends on the size of the furnace. The drop is most marked with the small furnace units, while 400 kw. hr. per ton are necessary with the one-ton furnace, a 6 to 7-ton furnace requires only about 200 kw. hr., and with a 20-ton furnace this can be reduced with certainty to 170 kw. hr. The curve is intentionally placed rather high, so as to include those cases in which, in order to meet special requirements or because of special conditions, an oxidation stage must be included in the electric furnace operation.

Total Cost of Refining

The total refining cost must include many items as well as the cost of current; for example, the cost of fluxes (ore, lime, sand, etc.), the additions of ferro-alloys, relining, maintenance and repairs, electrode consumption, wages, and

finally interest and depreciation. These separate items are brought together in Table 1.

Table 1.—Total refining costs.

	5-ton		10-ton		15-ton		20-ton	
	Basic	Acid	Basic	Acid	Basic	Acid	Basic	Acid
Fluxes	\$0.16	\$0.09	\$0.16	\$0.08	\$0.15	\$0.08	\$0.13	\$0.08
Ferromanganese	0.22	0.26	0.22	0.26	0.22	0.26	0.22	0.26
Ferrosilicon	0.25	0.08	0.26	0.08	0.25	0.08	0.25	0.08
Lining costs	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01
Upkeep and repairs	0.24	0.06	0.21	0.05	0.19	0.05	0.17	0.05
Electrode consumption	0.34	0.28	0.31	0.24	0.28	0.21	0.25	0.21
Current consumption	1.19	0.77	1.07	0.59	1.01	0.54	0.93	0.48
Wages	0.23	0.15	0.11	0.08	0.09	0.06	0.07	0.04
Interest and depreciation	0.14	0.09	0.09	0.06	0.07	0.05	0.06	0.04
Total	\$2.79	\$1.79	\$2.45	\$1.45	\$2.28	\$1.34	\$2.15	\$1.25

The figures given are mostly those worked out in practice and rest on prevailing market prices. Current is taken at 0.595c. per kw. hr., which is a figure that should be easy of attainment for most steel plants. The time per heat is taken as $2\frac{1}{4}$ to $2\frac{1}{2}$ hours. Three-phase furnaces are considered, and in the installation cost of the plant must be included transformers, cables and switchboards. Table 2 gives details regarding the kilowatts necessary.

Table 2.—Current and size of furnace.

Size of furnace	Kilowatts
1 ton	300 to 350
2 ton	400 to 450
3 ton	500 to 550
5 ton	750 to 800
10 ton	1000 to 1200
15 ton	1500 to 2000
20 ton	2000 to 2500
25 ton	3000 to 3500

There is much discussion regarding the possibility of building the Heroult furnace to take three-phase current. It may be mentioned that there is not the slightest reason why three-phase current should not be used for even a 1-ton furnace. Today there is a 2-ton three-phase furnace in operation at one plant, a $3\frac{1}{2}$ -ton furnace at another and a whole series of 3-ton to 7-ton furnaces under construction. The regularity of operation of such furnaces has proved to be excellent. A diagram taken on a 3-ton furnace showed an almost straight current consumption curve after the slag was completely fluid. From Table 1 it is seen that the cost of refining blown basic Bessemer material is \$2.79 per ton for the 5-ton furnace, which decreases to \$2.15 for the 20-ton furnace. This must be added to the cost of finished basic Bessemer steel, in order to get the cost of finished electric steel; in other words the cost of deoxidizing and adding ferromanganese, etc., must be subtracted from the refining costs given above in order to get the amount of difference between basic Bessemer and electric steel. The cost of deoxidizing, etc., basic Bessemer material, if assumed to be \$0.36 per ton, will not be too high, so that after subtraction the difference between the two steels is from \$2.43 to \$1.79. It must still be remembered that this includes current, etc., for an oxidation period which in most cases is unnecessary. For many plants, especially those working minette ores, \$1.79 is already below the difference between basic Bessemer and open-hearth steel.

Effect of Process on Structure

The results will be seen to be much better when the current consumption curves and refining costs for acid steel are considered; but first something should be said about the process itself. The investigation of the structure of the tool steels made at Remscheid led Director Thallner to the conviction that a large amount of the steel did not have the structure required for first-class tool steels, notwithstanding the very thorough chemical purity brought about by working with a white final slag. He was led to this conviction by means of a special method of testing which he developed at Remscheid. From each heat three notched test pieces about 30 x 15 x 80 mm. (1.18 x 0.59 x

*Stahl und Eisen, April 10, 1913.

3.149 in.) are broken in a special testing machine, in the hardened condition. The hardening temperatures are 750 deg., 800 deg. and 850 deg. C. The machine is so built that the breaking transverse load can be read directly on a scale at the right, and with most heats the results are about 4500, 2500 and 1000 kg. The fractures of the tests from the first two temperatures show a well-marked distinction between the hardened skin and the unhardened core; but this is not seen in the third test, which shows over the whole fracture an unsightly overheated grain, and very often water cracks. The sudden drop in the test results is due to this. In only a few cases does the character of the first two persist in the third, where the grain is finer and the core still shows good tenacity. The result is also correspondingly higher, being about 2000 kg., so that under certain conditions it is possible to obtain material that shows sufficient tenacity after hardening from 850 deg. C.

Thallner concluded after numerous observations made during his long practice that the method of melting is necessary to insure good structure and physical properties in the finished steel, as well as the proper heat treatment of the solidified steel. It would take us too far to investigate the Thallner theories in detail, but his conclusion is of great interest; that the qualitative properties of a material depend first of all on the atomic concentration—that is, the size of the molecules in the liquid condition; and that they are better the smaller the latter is. It may be possible, by carrying out the metallurgical process in a special way, to bring about the smallest possible size of crystal in the solid material. This may possibly be done by a special method of heating, or by the continuous interplay of chemical reactions in the metal bath, aiming at the breaking up of the molecules, and so prevent the formation of large complex molecules.

In this latter connection Thallner considered the acid hearth to be particularly good in conjunction with a special slag, and he developed the so-called acid process, during which the following reactions take place simultaneously in the liquid bath:

Formation of carbide of iron from the carburite.

Reduction of silicon from the lining, possibly by means of the formation of carbide of silicon.

Slagging of the reduced silicon by means of the oxygen dissolved in the bath of metal and the oxides of the slag.

Partial decomposition of the carbide of iron by the oxides of the slag.

Scarcely any other smelting process can be named in which so many reactions are taking place side by side, and if the ideas developed above are right then it is to be expected that this process will have, in the highest degree, a favorable effect on the structure and properties of the steel. That this is the case is shown by Table 3.

Table 3.—Results of Special Test in kg.

Carbon percent.	Kind	750 deg. C.	800 deg. C.	850 deg. C.	No. of Tests
0.70 to 0.79...	Acid	5126	4952	4414	51
0.70 to 0.79...	Basic	3458	1977	1367	23
Difference.....		1668	2775	3047	
0.80 to 0.89...	Acid	5180	4640	3900	75
0.80 to 0.89...	Basic	4000	1790	820	47
Difference.....		1180	2856	3080	
0.90 to 0.99...	Acid	5035	4320	3090	79
0.90 to 0.99...	Basic	4100	2700	800	31
Difference.....		935	1620	2290	
1.00 to 1.10...	Acid	5200	4250	3100	53
1.00 to 1.10...	Basic	4700	3000	1150	20
Difference.....		500	1250	1950	
1.10 to 1.35...	Acid	5104	4190	3280	26
1.10 to 1.35...	Basic	4200	3680	3170	33
Difference.....		906	510	110	

Superiority of Acid Steel—Results at Worcester and South Chicago

The great difference between the results of acid and basic steel is seen immediately, it being most marked in the samples quenched from 850 deg. C. These acid samples also show a difference between core and edge, the structure is always fine grained and has satisfactory tenacity. The author feels that these Thallner theories should not be passed over lightly, nor should the real differences as pointed out be denied. He states also that they can be readily tested and should not be characterized as pure speculations.

With regard to the economic considerations it may be

seen from the curves for current consumption and the refining costs that the acid material gives much better figures than the basic. For a 5-ton furnace the refining costs are \$1.79 per ton, which decreases to \$1.25 for a 20-ton furnace. If the amount \$0.35 is subtracted, which as explained above is needed to finish the basic Bessemer metal, then the difference in cost between basic Bessemer and acid electric steel is from \$1.45 to \$0.89. In the face of such figures it is confidently maintained that blown basic Bessemer metal refined in the electric furnace will cost less to produce than the present open hearth steel in fully 50 per cent of all the German steel plants. To what can this low cost be attributed? If the separate items given in Table 1 are examined the first great difference is seen to be in the cost of ferrosilicon. This is because with the acid hearth it is not necessary to add silicon in the form of ferrosilicon, it being taken directly from the lining by reduction. The next difference is in the maintenance and repair costs due to the shortened time per heat. While $2\frac{1}{4}$ to $2\frac{1}{2}$ hours are necessary for basic material, $1\frac{1}{2}$ hours at the most is enough for acid steel. This also causes the smaller electrode consumption, and above everything else the greatly reduced current consumption. These results are not theoretical but are taken mostly from practical tests, among others those obtained by a steel works superintendent, Schmitz, during the last year with the 15-ton furnaces in the United States. Mr. Schmitz has succeeded in lowering the current consumption per ton to 105 kw. hr. for 8-ton to 10-ton heats at Worcester with a basic furnace, and 75 kw. hr. with 15-ton heats at South Chicago. The steel at the first place was for wire, and at the second for rails; the time per heat was from 50 min. to 1 hour.

High Sulphur Not Injurious

The first question that naturally arises is: What causes the smaller current consumption noticed in acid practice? First, the acid process is a considerably more active one than the basic. This is due to the increased number of re-

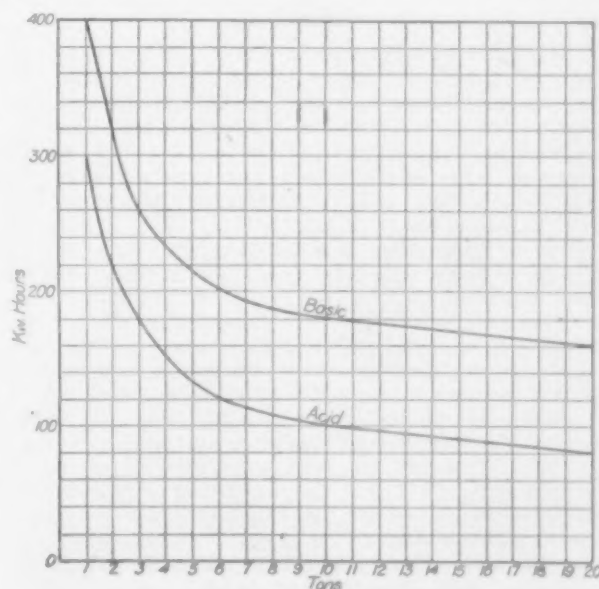


Fig. 2—Current Consumption Curves for Liquid Charges

actions taking place which bring about a more thorough working of the bath. Also the lining is more resistant to the passage of heat and electricity than a basic lining. Further there is less heat during repairs because of the greater durability of the hearth and roof. The next question is: What is the effect of the higher sulphur necessarily present in the acid steel? The considerably better results shown by the acid steel under the notched pressure test have already been noticed. The heats used for these tests were not made from specially pure raw material but from the regular normal charges. They therefore show a sulphur content from 0.04 to 0.07 per cent, while the basic steel at the most has only 0.015 per cent. Notwithstanding the higher sulphur content these acid heats show considerably better results. Practical tests with tool steels and structural materials have fully confirmed these results.

It is maintained, therefore, that the higher sulphur content of the acid electric steel is not harmful, its effect being completely neutralized by the excellent internal structure of the metal. This has been confirmed by practical tests at other plants. There should therefore not be the slightest hesitation in allowing a similar sulphur content for the whole field of the middle qualities of steel. From the experience at Remscheid special steels of the highest quality may show sulphur of 0.06 per cent when made in the acid furnace.

Another question that comes up is, in case a thorough substitution of electric steel for open hearth steel takes place, how will the large amounts of scrap be disposed of? The electric furnace is not suited to dispose of them, but it is technically possible to take care of all the scrap in the mixer. Heated mixers are being used more and more, and there seem to be no technical or metallurgical reasons why the heating should not be carried to the extent that the melting of a large amount of scrap will be possible, the relative decrease in oxidizable constituents (manganese, silicon, phosphorus) being equalized by the increased temperature of the metal.

A brief account is also given of experiments with the ore refining process in a basic Heroult furnace, and two sets of refining curves are given, in the original paper. In general the arc furnace is by no means suited for a refining furnace to carry out oxidizing processes. There is no stream of oxidizing gas; indeed the conditions are reducing because of the prevailing carbon monoxide atmosphere. Nevertheless with a suitably formed hearth and the use of a relatively high ore addition, a fairly efficient oxidizing action can be produced. Rough estimates on refining a basic Bessemer iron show that the costs with a 20-ton furnace are comparatively low, and under certain conditions would be the same as the sum of converter costs and subsequent refining in the electric furnace. A final opinion of the process cannot be given, however, for the necessary tests on a large scale have not been carried out.

Discussion

The paper was followed by a thorough discussion, the principal part being taken by Professor Neumann of Darmstadt. He said that the statements that higher sulphur in acid electric steel was not harmful were astonishing, and the view that internal structure alone was the determining factor in the properties of the material was so new that it aroused skepticism. He also took exception to the Thallner theories, and to the new notched pressure test alone being taken as decisive that the high sulphur material is better than other steel. The results should be fully confirmed by other mechanical and practical tests. The great difference in power consumption between the acid and basic steel is pointed out as being too high, and the successful carrying out of an ore-pig iron refining process in the electric furnace is doubted because the electrodes are so badly attacked. Mr. Eilender replied that the Thallner theories depend on our present chemical and physical views, and must be considered as an attempted explanation of a question at present unsolved in the metallurgy of steel. The Thallner test results have been supplemented by others, such as bending, shock, and breaking tests, which give rise to the same conclusions. Above everything else practical tests have been carried out. All kinds of tools and parts for automobiles, etc., have been tested with equally good results. In regard to the difference in the power consumption between basic and acid steel it was expressly stated that the former included a possible oxidation period. There was no intention to try and make the difference between basic and acid appear as great as possible; for instance, the figure of 90 kw. hr. per ton was used, although Mr. Schmitz succeeded in lowering it to 75 kw. hr.

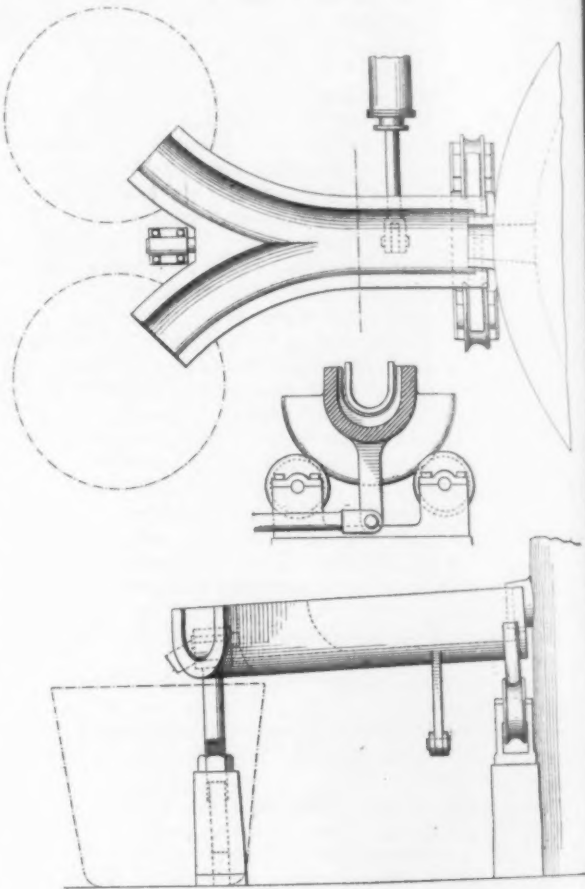
Electrode consumption figures are naturally higher for the ore-pig iron process than for refining blown Bessemer metal. The tests showed it to be 6 to 8 kg. and these figures were used for the cost calculations.

In reply to other questions he stated that in the acid steels the copper varied from 0.07 to 0.10 per cent and the average sulphur was about 0.05 per cent. The carbon in the soft steels made was from 0.08 to 0.10 per cent, and the manganese from 0.25 to 0.30 per cent.

G. B. W.

A Branched Runner for Open-Hearth Furnaces

A patent has been granted to Edward L. Ford, Youngstown, Ohio, on a ladle runner for open-hearth furnaces. The inventor has provided a branch runner in which the use of regulating dams is obviated and in which the flow of metal is controlled by a rotary movement of the runner.



A Branched Runner for Open-Hearth Furnaces.

so as to vary the angle of inclination of the branches. Three views are given in the illustrations—a plan, a side elevation, and in the smaller one a cross-section. In all the method of rotating the runner is indicated, as by connection with a power cylinder. The Y-shaped runner is mounted for rotary movement upon an axis which is coincident with the center of the furnace tapping hole and preferably as nearly horizontal as possible to get the desired rapidity of flow of the metal. If one ladle fills faster than the other, the runner is rotated so as to raise the branch discharging into that ladle and this directs more metal into the other ladle. All the metal can be delivered into one ladle if desired by rotating the runner. In referring to his device the inventor says that new plants having 100-ton furnaces will need only 50-ton ladle equipment and old plants can make heavier furnace charges without securing larger ladles. In casting from two ladles the steel need not be as hot as when 100 tons is run through a single nozzle, the tendency in the latter case being to overheat to avoid skulling.

The Pratt Institute, Brooklyn, N. Y., announces that the annual exhibit of the work of its day students will be held as follows: Thursday, June 12, 2 to 5 p. m.; Friday, June 13, 10 a. m. to 5 p. m.; Saturday, June 14, 10 a. m. to 5 p. m. This exhibit is open to the public and affords those who are interested in industrial and technical education an opportunity not only of viewing the work of the students in the various courses but also of inspecting the methods and the equipment of the school and its general facilities for conducting this kind of training. Its day and evening courses are for both men and women in a great variety of vocational subjects, including technical and trade training for men along several important lines.

A Duplex Back-Geared Drilling Machine

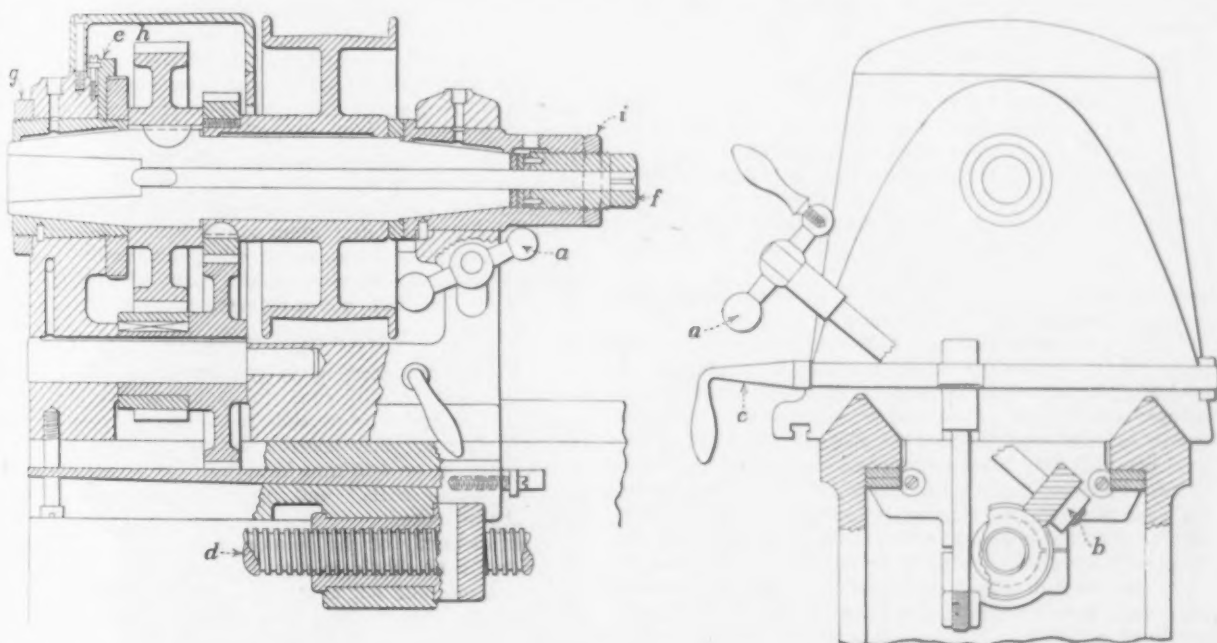
A new type of duplex horizontal, back-geared drilling machine has been brought out by the Garvin Machine Company, Spring and Varick streets, New York City. The principal improvements made in this machine are changing the design to avoid trouble from chips interfering with the free sliding of the heads on their ways and providing an adjustment for each head which will permit a short, worn drill to be used in one head and a long, new one opposite it. While this machine in general appearance is the same as the one which was illustrated in *The Iron Age*, May 1, 1913, it is larger, has a different spindle construction and has a screw feed with rotary micrometer adjustment for resetting the heads. This adjustment can be used in a number of ways, such as, for example, where work is to be faced to shoulders, working from fixed points, either head can be adjusted accurately, and as the tool wears or is ground this adjustment will permit of resetting for maintaining the same over-all facing length.

Referring to the accompanying drawing, which shows the spindle construction and the arrangement of the various parts, the ball handle *a* rotates a nut through spiral gears *b*. This nut is unclamped by moving the eccentric binder *c* and reclamped after the proper adjustments have been made. Taper gibs, gibbing from below the V's on

back gears will drive a $1\frac{1}{8}$ -in. drill. The weight of the machine, including the overhead countershaft from which it is driven, is approximately 2000 lb.

Beginning of East Texas Iron Ore Shipments

PORT BOLIVAR, TEXAS, May 29, 1913.—The East Texas Iron Ore Development Company will soon place in regular service 150 standard ore cars for transporting iron ore from the iron mines that are being opened up in Cass County near Ore City to Port Bolivar. The first cargo of ore will be shipped from Port Bolivar consigned to B. Nicoll & Co., New York, via the New York & Porto Rico Steamship Company on June 22. The ore will be unloaded at Philadelphia for use in the Swede furnaces at Swedeland, Pa. The ore dock built here, opposite Galveston on Galveston Bay, is operated by the Gulf, Bolivar & Santa Fé Railway. Approximately 300 tons of ore will be loaded upon cars daily at the mines in Case County. Extensive preliminary work has been done at Ore City, including the exploration of a large tract of land that contains the ore deposit. A large crusher and washing plant is also being installed. The first ore that is shipped will be float ore which is found upon the surface in large quantities. This will not require washing. J. M. Niblett, Jr., is in charge of the mining operations. The Port Bolivar Iron Ore Railroad was recently constructed from



Details of a New Type of Duplex Horizontal Drilling Machine with Back Gears Showing the Spindle Construction and the Arrangement of the Various Parts

both sides, keep the heads to their bearings. The hardened screw *d*, which is cut with a right-hand thread on one end and a left-hand thread on the other, feeds the heads forward through intermediate bevel gears from the power feed box. This worm gear shaft is extended to receive a capstan wheel with a handle for quick return, which is located centrally between the two heads on the front of the bed.

A special construction is employed for the spindle which is hardened and ground all over, and both the front and rear bearings are of the taper variety with means for adjustment to compensate for wear. In adjusting the spindle it is simply necessary to slack off the nut lock *e* and back off the thrust screw *f* and the nut *g* on the front box. The nut *h* is then tightened up, drawing the front box and spindle back into the rear bearing, after which the nut *g* is tightened and the nut *h* is loosened until on turning the driving pulley the spindle will rotate freely. After this has been done the thrust screw *f* is brought to touch and the nut *i* is jammed, the nut lock *e* entering into the notched recess in the nut *h*.

The back gears, which have a ratio of 3 to 1, are housed to give protection to the operator and also to prevent injury to the gears themselves. This machine will handle $1\frac{1}{2}$ -in. drills in cast iron and when supplied without the

Longview to Ore City, 24 miles, for the special purpose of handling this ore traffic. This road is a part of the Atchison, Topeka & Santa Fé system. The dock here, which was described in *The Iron Age* of April 18, 1912, is 324 ft. long and the loading capacity is 300 tons an hour.

The fifth annual meeting of the Special Libraries Association (business librarians) will be held at the Hotel Kaaterskill, Catskill Mountains, New York, June 24 to 26. An unusually attractive programme has been arranged. There will be three meetings on (1) the relations between general and special libraries, (2) the handling of clippings and training of special librarians and (3) special library organization, etc. Guy E. Marion, librarian of Arthur D. Little, Inc., Boston, Mass., is secretary.

The Titusville Forge Company, Titusville, Pa., recently purchased by the Bethlehem Steel Company, is making extensive improvements. Additional buildings are to be erected, which will be of steel construction, and are to be completed by August 1. Much new machinery has been ordered, including electric cranes, coal conveying apparatus, machine tools, forging presses, etc. The improvements are estimated to cost over \$500,000.

The By-Products of Retort Coke Manufacture*

Present Yield in the United States—Improvements on German Oven Construction and Practice—Horizontal vs. Vertical Flues

BY CARL A. MEISSNER

Uses of the Various By-Products

Tar is used largely for two purposes, namely, distillation for production of creosote and light oils and pitch, and for use in road making. Both of these uses of tar have increased very greatly in the last few years and the tendency for still further increase indicates a very large proportion of the future production will be similarly used. Tar is further being used successfully in open-hearth furnaces, replacing producer gas; also in heavy oil engines, providing it does not contain too much free carbon. It has also been burnt with success under boilers through specially devised burners.

The ammonia, in the form of concentrated ammonia liquor, is used in making anhydrous and aqua ammonia for refrigeration, and other purposes, in the production of soda, ash, explosives, and in other lines of chemical manufacture. Sulphate of ammonia is very largely used as a fertilizer, although in some cases it is converted to ammonium hydrate for use in chemical manufacture. When used as a fertilizer, it is usually mixed in definite proportions with other fertilizer ingredients, such as acid phosphate, potash, etc., according to the conditions.

The coke dust is used to advantage in the steel mills in soaking pits, etc. Coke dust up to $\frac{1}{4}$ in. in size can also very profitably be burnt in specially designed grates under boilers. The coke breeze is sold for domestic purposes, having been screened and sometimes sized. In locations where coal is cheap the disposal of the coke breeze may at times be somewhat troublesome.

The surplus gas obtained from the coke ovens, which has a value of 400 to 650 B.t.u. per cu. ft., depending on the coal used, is one of the most valuable by-products. It can be used for all sorts of heating purposes at the steel plant and its value in replacing coal for all purposes at one of our steel plants is equivalent to approximately 500,000 net tons of coal per year, based on 40,500 cu. ft. of surplus gas being equivalent to one net ton of coal at that point. This surplus gas is also used for illuminating purposes and can be piped long distances for this purpose. In Europe it is used quite extensively in gas engines. Experiments have also been made using it in the open-hearth furnaces alone or mixed with blast furnace gas, the latter method having been largely adopted in certain parts of Europe and I believe ultimately in this country will receive due consideration.

The principal uses of benzol and its products are:

- (1) As a motor fuel.
- (2) To enrich the illuminating power of gas.
- (3) In manufacture of aniline dyes.
- (4) As a solvent for rubber and similar substances.
- (5) In the manufacture of gunpowder.

Production of benzol in Europe has increased enormously in recent years due to its increasing consumption as a motor fuel in place of gasoline. At the same time, the price has steadily increased, more than keeping pace with the increased production.

Economies of the Gary Retort Ovens

It is my firm conviction that, when located at points suitable to its requirements, the by-product coke oven is the most satisfactory and economical system yet known for the manufacture of metallurgical coke. It also furnishes a desirable method for the production of illuminating gas and domestic coke and we are able to utilize practically all the valuable constituents of coal.

As a great conservator of the national resources of the country's fuel, it should receive the closest study. Take the Gary, Ind., by-product coke oven plant as a concrete example: In the last six months of 1912 we actually pro-

duced coke at the rate of 2,900,000 tons per year on a mixture of 76.4 per cent. Pocahontas and 23.6 per cent. high volatile coals. The conservation of coal through producing this amount of coke in by-product ovens instead of beehive ovens amounts to about 1,190,000 tons per year. Furthermore, the actual utilization of the surplus gas for various heating purposes at this plant, for the same period, is equivalent to an annual saving by replacement of practically 500,000 tons of coal. In other words, in the annual production of 2,900,000 tons of coke at the Gary, Ind., by-product coke oven plant, a saving of practically 1,700,000 tons of coal, based on above mixture of low and high volatile coals, has been accomplished, which means the conservation of that amount of the coal of our national coal reserves from the operation of that one plant alone. This amount of conservation would not occur in case of using all high volatile coals, because the difference in yield from the low volatile Pocahontas coal when coked in retort ovens as against beehive ovens is much greater than is the case with high volatile coals. For instance, if the above-mentioned tonnage of coke had been produced entirely from Connellsville coal, the saving of coal due to the greater yield in retort ovens would have amounted to about 475,000 tons per year. This with the saving due to replacement of about 500,000 tons of coal by surplus gas would give a total conservation of practically 1,000,000 tons of coal per year when using all Connellsville coal as against 1,700,000 tons of coal per year when using the mixture at Gary, Ind., above referred to.

The Question of Quality

The coke produced in by-product coke ovens, when properly made, is fully equal in quality to that produced in beehive ovens; it is possible to utilize a larger variety of coals when properly selected and mixed, including coals which up to the present time have been practically regarded as "non-coking coals," and make a highly satisfactory metallurgical coke.

I am distinctly of the opinion that in this country the by-product coke should in most cases be made at the blast furnace plants and not at the coal mines, for in this way it becomes possible to mix coals from various localities to great advantage. I believe that the operation of blast furnaces and coke ovens can be conducted in a more intelligent manner when the coke ovens are located at the blast furnace plant and are under the same management; this also allows a better distributing point for the by-products, such as tar and gas, which can be consumed to great advantage in the works, when the blast furnaces are connected with large steel plants.

As to the constructive features of by-product coke ovens, which I have described somewhat in my paper, while we have learned a great deal from the Germans, yet I am frank to say I think we have improved very greatly, not only on their construction, but also on their practice, particularly in the amount of output per day per oven, at the same time preserving, if not improving, the quality of the coke by so doing.

No Fear of Excess of Nitrogen

As to the possible over-production of nitrogen, careful study of the whole situation would indicate we need have no apprehension that the supply will exceed the demand. The increasing production of ammonium sulphate is making it possible to supply the farmer with the nitrogen he requires for intensive farming, and as this supply increases, he will be able to cultivate his land to better advantage and obtain a larger product per acre. I also believe, as the supply increases, it will tend to stimulate that demand which at present lies dormant.

In the United States there were produced in 1911 about 127,000 tons of ammonium sulphate and sulphate equivalent.

*Further extracts from a paper before the American Iron and Steel Institute, New York, May 23, 1913.

We consumed approximately 230,000 tons, or nearly twice as much as the production. If we recovered the ammonium sulphate from all the 53,000,000 tons of coal coked in this country in that year, it would have amounted to nearly half a million tons, or about twice the present consumption. If the present rate of consumption increases in anything like the ratio for the last ten years, then the consumption of ammonium sulphate will in a comparatively few years equal the greatest possible production obtainable through the coking of coal, and we all realize that before all of the coal is coked in by-product ovens in this country more than 10 years must have elapsed. The probabilities are that the increase in the demand for ammonium sulphate produced from coal will in time exceed the supply from this source so that the further supply of nitrogen must come through the use of nitrate of soda from Chile, which has been and still is extensively used, and through other methods of obtaining it, such as from cyanamid, of which approximately 250,000 tons per year are being produced, as well as synthetic ammonium nitrate and sulphate processes, peat, etc. Some of these latter processes, however, can still be stated to be in the experimental stage, even though large amounts of money have already been spent in efforts to develop them. Their value as competitors to the present known and used fertilizers through their ultimate economical production is too uncertain at this time to be discussed by me in detail.

A careful study of what the various governments are doing, through their agricultural departments, in the way of educating the farmers as to the advantages of artificial fertilizers, and a consideration of what is likely to take place in the production of nitrogen from the above sources, leads me to believe that the demand for artificial fertilizers, for a great many years to come, will be in excess of the supply.

Referring once more to the sulphate of ammonia, my conclusions are that the nitrogen in sulphate of ammonia can be produced at a lower cost than in any of the above sources of supply; in other words, that considering all of the above sources of supply, sulphate of ammonia, as made in the by-product coke ovens, will at all times give a handsome return on the money invested.

There is an ever-increasing demand for the surplus gas for the many different uses of heating required in a steel plant, or for illuminating purposes, which will always cause the surplus gas to remain a by-product of great value.

The use of tar, which formerly was a drug on the market, has of late been greatly stimulated, as its advantages for roofing purposes, binder for road building, creosoting, burning in open hearth furnaces, etc., have become more fully recognized.

Benzol is now extensively used abroad as a motor fuel and the same conditions are likely to prevail here. Recent tests have shown that benzol is the equivalent of gasoline for this purpose. In fact, better results have been obtained with it in automobiles than with gasoline.

As I previously stated, all of the coke in Germany is made in retort coke ovens and about 80 per cent. of these are equipped for recovery of by-products. From the rapid progress that is being made in this country, I firmly believe the time is coming when the same condition will prevail here in this country.

Discussion by William H. Blauvelt*

I cannot express too highly my appreciation of the presentation which Mr. Meissner has given us of this subject, which is one of great interest to so many members of this Institute. He has put the subject before you in a better way than any representative of any of the oven systems could have done and his paper will be of great value to the art.

Twenty years ago this month the first by-product ovens in this country were started in Syracuse, and Mr. Meissner's paper tells us what the 20 years of work have done for the industry. As in so many other cases, American engineers have developed this European invention most fully on the side of economy of operation and size of output. The first ovens in American coked 44 tons of coal per oven per 24 hours, and 25 ovens, with a carbonizing capacity of 110 tons a day, were regarded as the proper unit for one crew of men. The oven of to-day is carbonizing 20 tons per day, and practically the

same crew of men, with the help of modern machinery, will handle 50 ovens or more, carbonizing 1000 tons per day.

Coke Making in Great Britain in 1911

Supplementing Mr. Meissner's figures, I have received some figures regarding coking in Great Britain which are not entirely consistent, but from which I have compiled the following:

Beehive ovens in 1911.....	14,300
Coal coked per oven per day.....	2 tons
Total coal coked per annum (300 days).....	8,580,000 tons
Coke, at 65 per cent yield.....	5,577,000 tons
By-product ovens.....	6,524
Coal coked per oven per day.....	5 tons
Total coal coked per annum (360 days).....	11,743,200 tons
Coke, at 70 per cent yield.....	8,220,240 tons

Changing these figures to American net tons for comparison with our figures, we have

Beehive coke produced.....	6,274,125 tons
By-product coke produced.....	9,247,770 tons
Total coke produced.....	15,521,925 tons

These figures show that 59.5 per cent. of British coke is made in by-product ovens.

The value of the retort oven in the conservation of our coal fields, especially in low volatile coals, is of the utmost importance. It may be illustrated in another way as follows: Pocahontas coal in a beehive oven yields 60 per cent. of coke; in a retort oven from 80 to 84 per cent., an increase of one-third or more. Therefore, the owner of a Pocahontas deposit of coal of, say, 1,000,000 tons, which he proposes to turn into coke will in effect increase his 1,000,000 tons to 1,333,000 tons by the substitution of retort for beehive ovens. Or, a blast furnace owner having a supply of Pocahontas coal that with beehive ovens will last him 10 years, will increase the life of his coal supply 33 per cent. by substituting retort ovens for the beehives.

These figures are applicable to a smaller extent to coal fields where the difference in coke yields is less.

Coking Time and Coke Quality

The coking time in a retort oven depends mainly upon four points: the heat of the oven, the quality of the coke desired, the composition of the coal and its moisture content, and the width of the oven. Taking these up in inverse order, other conditions being equal, the time of coking is practically in direct proportion to the width of the oven. It may be possible to show that theoretically the wider oven should delay the rate of coking per inch of width, but we have not been able to show this in practice. An increased amount of volatile matter seems to require more gas in the flues per unit of coal coked in a given time. I say "seems," because it has not been worked out definitely, but that is the general opinion of the operators. This might readily be so even though the coking of coal is an exothermic reaction. With a given temperature in the coking chamber, and therefore in the escaping gases, the increased volume of gases carries off more heat from the oven. Wet coal requires more heat. Some experiments made at one plant where the moisture in the coal varied greatly indicated that for each per cent. of moisture something more than 120 ft. of additional gas was required per ton of coal coked. Of course, if the gas burned was maintained constant, producing a constant amount of heat, the above influences would increase the coking time.

The quality of the coke produced is affected by the temperature at which the coking is carried on. At some of our plants we have found that to make blast furnace coke that will best satisfy our customers the coal should be coked as rapidly as possible. That is, higher heats and the resultant short coking time produce the well-developed cell and the hard, thin cell wall, which seem best suited to the blast furnace. This harder coke is also more brittle and tends to produce smaller pieces. The foundry trade supplied from these same plants, on the other hand, is best satisfied with coke produced at lower heats, resulting in from 20 to 25 per cent. increased coking time. These lower heats produce a blockier coke, and a thicker, softer cell wall, conditions which seem better suited to the operation of the cupola.

The heat of the oven is, of course, the prime factor in determining the coking time, and, other conditions being equal, the one is directly dependent on the other. Of

*Consulting Engineer Semet-Solvay Company, Syracuse, N. Y.

course, in making any such comparisons as the above, it is necessary to assume that the oven is properly heated, that the supply of heat in all parts is proportioned to the width of the oven, that there are no cold spots which will delay coking in one portion of the charge while the remainder is over-coked, etc.

Division Walls Between Ovens

The 18-in. division wall between the ovens in the Semet-Solvay system has been mentioned as allowing the operation of an adjoining oven while the oven is being repaired. This is a minor point, especially as some blocks of Semet-Solvay ovens have a record of seven years' operation without any repairs. One of the principal advantages of the division wall is that it makes the construction very strong and durable, free from distortion, and removes the load of the heavy brick top and the charging car, etc., from the thin flue walls. Perhaps the most important advantage, however, is that these walls form a reservoir of heat. A charge of 16 tons of coal, carrying perhaps as much as 8 to 10 per cent. of moisture, demands a large amount of heat in the first hours of the coking period. The division walls which are heated to the full temperature of the flues at the end of the previous coking period form an important reservoir of heat which is freely drawn upon when needed, and helps to maintain uniform temperature. It has been found that the additional cost of these walls and the additional space occupied are fully justified by the advantages gained.

Utilization of Gas

One important use for the surplus gas from coke ovens is as illuminating gas for municipal consumption. This has progressed much farther in this country than in Europe, and from 40,000,000 to 50,000,000 ft. per day of illuminating gas from coke ovens are now produced and sold in the United States. With the rapidly increasing cost of oil, this is becoming an important matter, and much attention is being given just now to the wide development of this market for coke oven gas. Some plants of considerable importance are being fitted with producers, so that the entire amount of gas distilled from the coal may be made available for illuminating purposes. This gas is essentially the same as ordinary coal gas, and its production for this purpose is without any effect on the quality of coke produced. As experience in oven operation develops, the original troubles of irregular supply and variable quality have been largely overcome, so that municipal gas companies are becoming more accustomed to depending absolutely upon this supply.

Advantages of Horizontal Flues

As Mr. Meissner has intimated, no type of oven contains all the points of excellence, and there are several types which will give entirely satisfactory results *when properly operated*. I will return to this point again.

I have learned this morning that Professor Simmersbach, of Breslau, has agreed to contribute to this discussion a paper on the vertical flue oven, and the reasons for its general use in Germany. As the type of oven with which I am best acquainted is one of the chief representatives of the horizontal flue type, it seems appropriate that I should take this opportunity to give the reasons why the representatives of this oven have continued its use and believe in it, notwithstanding that it is in numerical minority.

The proper heating of a modern by-product oven is a difficult undertaking, as all metallurgists who have had experience with the heating of furnaces will readily recognize. The side of a modern oven is 36 ft. or more long, and perhaps 11 or 12 ft. high. This whole surface must be heated continuously to a high temperature. The heats in the flues run from 1100 to 1300 deg. C. This temperature must be accurately controlled over every portion of this surface, so that there are no cool spots to delay the coking process, and no overheated spots to injure the brickwork. In addition to this, the heat must be accurately controlled from top to bottom, and on account of the taper of the oven chamber just the right amount of additional heat must be supplied at the wider end of the oven to carbonize the additional amount of coal there, so that the whole coking process will be completed at the same time. Failure or imperfection in any of these points, and a number of others, results in inferior coke, probably combined

with reduced yields of gas and by-products. In a large plant there may be several hundred of these surfaces, and irregularities in the heats of any of them, in relation to the others, affect the efficiency of the plant. As Mr. Meissner has pointed out, good and efficient results may be gotten from a number of the well-known systems, and no one type has all the advantages. The principal advantages of the horizontal flue system are that every portion of every flue can be conveniently observed by the operator, and the means for correcting any irregularities are right at his hand as he makes his observation. Work that is done conveniently and in comfort to the operator is usually done well, and when every portion of every flue is convenient for observation, and any fault may be corrected at once, regularity in oven heating is sure to be at its maximum.

The principal product of a by-product coke oven is coke, and the principal point in the oven operation is the control of the heats. Given good construction and simplicity of parts, the oven that permits the most convenient and accurate control of the heats is the best oven.

Returning to the point which Mr. Meissner emphasizes so strongly, namely, the importance of proper operation, I want to emphasize this point again. Good operation is a sine qua non, and calls for great attention to detail and the most careful application of metallurgical, chemical and mechanical engineering. I know of no manufacturing operation where the difference in the results from the very best and experienced, versus indifferent or inexperienced, operation is more striking.

Essentials of a Well-Designed Oven

Recent writers on the subject have suggested the following points as important to a well-designed oven:

1. Largest yield of surplus gas.
2. Ability to substitute producer gas for oven fuel gas.
3. Maximum yield of by-products.
4. Maximum yield of good coke.
5. Shortest coking time.
6. Lowest cost of operation and repairs.
7. Simple and strong with weight properly distributed.
8. The introduction of gas and air must be arranged

so that they are easily controlled and the design must be such that all parts of the combustion system can be easily observed.

The primary point in oven design is simplicity. Anything that involves elaboration or multiplicity of parts should be avoided. Easy access to every part is essential, because if it is not easy to give attention to a detail it will be neglected. This point especially applies to No. 8 in the above list, for the proper heating of an oven is the first requirement.

One point that is often neglected is that one operation must not interfere with another. The ordinary workman is glad of an excuse to stop work, and the net efficiency of any plant is seriously affected if one set of workmen have to be frequently getting out of the way of another set.

The practical advantages of a simple plant apply equally well to the recovery of the by-products and all the operations around a coke plant. "Safety first" has been adopted as the slogan of some of our great manufacturing plants. I would suggest "simplicity and efficiency" as the first maxim for the student of by-product oven design.

Discussion by Christopher G. Atwater*

Mr. Meissner's able and comprehensive paper has brought out the present status of the by-product coke oven very clearly, and to my mind has set forth convincingly the advantages it has over the beehive or non-recovery type of oven. It is no longer possible to regard the by-product coke oven as either a beautiful but impractical chemical vision, or a striking instance of what the foreign steel men have to do that we do not have to do, or as a costly and dubious venture into the "chemical business." The recovery oven has achieved a definite place as a part of the steel-making process, and presents economies and advantages with which the present-day steel makers must reckon.

On the broader ground of national economy, the outlook is gratifying, for we can see in it progress towards the complete elimination of the loss and noxious waste

*American Coal Products Company, New York.

gases due to the beehive ovens and an appreciable saving in our industrial consumption of coal. Aside from its use in iron smelting, or parallel to it, the recovery oven has a field in the supply of coke as a smokeless fuel, in place of anthracite coal, a need which no other form of solid fuel seems likely to supply permanently unless it be anthracite briquettes, the manufacture of which is also dependent upon coke oven pitch.

If to the above-mentioned purposes we add the service of the by-product coke oven in supplying cheap illuminating gas, ammonia, tar and benzol, we cannot but realize that we are dealing with an industry of wide scope.

Sir William Siemens' Forecast

Twenty years ago, as Mr. Meissner says, the first by-product coke ovens were put in operation in this country, at Syracuse, N. Y. It has therefore seemed appropriate to exhibit to you photographs of the original twelve ovens. At that time much of what we now see clear before us as demonstrated facts was mere theoretical surmise. But 22 years before that Sir William Siemens saw some of the outlines clearly and put his belief into words that I cannot forbear quoting, since, where so much has been fulfilled, it seems reasonable to expect that all will be. In a lecture delivered in Glasgow in 1881, after paying his respects to the smoke nuisance with characteristic incisiveness, he summed up his beliefs as follows:

"I am bold enough to go so far as to say that raw coal should not be used as fuel for any purpose whatsoever, and that the first step towards the judicious and economic production of heat is the gas retort or gas producer, in which coal is converted either entirely into gas, or into gas and coke, as is the case at our ordinary gas works."

Sir William Siemens dies before the by-product coke oven attained any commercial importance; yet it is a significant fact that the regenerative principle which bears his name is now accepted by practically all the well-known oven systems as the most economical in operation.

Importance of Dr. Schniewind's Work

I wish to add a line to Mr. Meissner's excellent historical summary. In 1898 the principle of the division of gases by which the gas from the coke ovens was first made suitable for general illuminating purposes without further enrichment was brought forward by the late Dr. F. Schniewind. Through many discouragements, and in the face of international skepticism, his method has now attained international introduction. In explanation of this statement I would say that the average run of coke oven gas contains ample heat units but does not have illuminating value sufficient to satisfy the usual city requirements. Dr. Schniewind proposed to use the first fraction of the gas distilled off, containing the major portion of the lighter hydrocarbons for illuminating purposes, by means of a separate system of mains and condensing apparatus. The success of his plan has been conclusively demonstrated at the Everett plant, supplying gas to Boston and vicinity.

Thus coke oven gas which may be worth from 4c. to 8c. per 1000 cu. ft. as fuel, according to the value of the coal it replaces under boilers or in metallurgical furnaces, brings a price two or three times as great when delivered to the mains of a gas company.

In view of Dr. Schniewind's identification with the development of the by-product coke oven in this country from its very inception, I feel that this brief recognition of perhaps his most conspicuous service to the industry, though by no means the only one, is not out of place here.

Coal Drying

A device to dry washed coal quickly and cheaply has long been needed. If the method Mr. Meissner mentions fulfills his expectations, it will find a wide field. In this connection I would call attention to the fact that in my experience a coal that was too dry made an improved coke when dampened up to 5 per cent. of water. The difference between the dry coal and the dampened coal was quite apparent in the coke, and there was also an added advantage in handling and charging the damp coal, as it made less dust. I attribute the gain by dampening entirely to the closer packing of the coal in the oven, similar to the effect of coal compression, but in a less degree. The damp

coal probably required a little more heat to coke it, but it was not appreciable, and there was possibly a slight gain in the ammonia yield.

Coking Time and By-Products

As regards the effect of a reduction in coking time on the by-products I may say that whether a change from 24 or 20 hours' coking time to 16½ hours does or does not affect the amount of tar, it has frequently been found to influence its quality unfavorably. The percentage of free carbon is increased beyond what is desirable; the tar acids, among the most valuable of the tar constituents, are decreased, and the naphthalene is undeniably increased.

There is also some reason to think that a shorter coking time usually means less actual tar output per ton of coal, as the higher heat is apt to crack the hydrocarbons and produce more carbon and waste pitch in the mains. I have examined the figures of the by-product industry in the United States for evidence on this point as far as they were available, and find that for the years 1908 to 1911 inclusive the percentage of tar to coal fell regularly from 3.75 per cent. of the coal to 3.3 per cent., while during the same period the ammonia recovery, reckoned as sulphate, has risen from 0.867 per cent. to 0.905 per cent., though not with the regularity of the tar decrease. I do not feel, however, that these figures should be regarded as conclusive either way, because other factors may have come in. (See Table I.)

As Mr. Meissner truly says, the reduction in value and amount of the tar and ammonia is not of so much importance as the increase in yield and possibly quality of the coke on the shorter time, at least for blast furnace purposes. Nevertheless, it is a factor that should be considered in its proper place.

Table I—Yield of Tar and Ammonia in By-Product Coke Ovens in United States

	Tar, per cent. of coal	Sulphate of ammonia, per cent. of coal
1908.....	3.75	0.867
1909.....	3.62	0.904
1910.....	3.5	0.91
1911.....	3.3	0.905

In connection with the processes for making sulphate of ammonia, using the sulphur in the gas, I may mention that of Burkheiser, in which a special oxide purifier removes the sulphuretted hydrogen from the gas, which is then used to make an acid solution for recovering the ammonia, the latter being obtained as sulphate and sulphite. I am not aware, however, that this process is in actual use anywhere in this country.

A modified form of the Feld process, to which Mr. Meissner refers, has been used at the works of the Central Union Gas Company in New York with some success.

The Market for Tar, Sulphate and Benzol

Regarding the uses of tar as a by-product, it should be said that one of the largest purposes for which tar is distilled is to produce refined tar for saturating felt, this felt being afterwards used in combination with pitch to make the various well-known forms of tar roofing and waterproofing. More pitch, in fact, is used for roofing and waterproofing than for any other one purpose in this country.

The use of tar as an application to roads is one of the most promising and satisfactory outlets for it. Nevertheless, it is not all plain sailing in this direction. The haphazard application of crude tar, without refining or examination to determine its fitness for that purpose, has frequently proved unsatisfactory in the outcome, and has been known to give the tar treatment a black eye in that district. On the other hand, the use of a water free and blended tar, conforming to the specifications that experience has determined as best for the condition prevailing, has been highly successful under severe conditions of service. The application may be made cold, or with heated tar, or as a soft pitch, in which case it is incorporated with the road material while building.

As regards the prospect of an increase in the production of sulphate of ammonia overtaking the demand for nitrogen in that form as a fertilizer, I think we may safely conclude that there is no immediate danger on that score if proper educational methods are employed. If we glance over the table quoted by the author on the fertilizer con-

sumption of the various states of the Union, we find a wide difference, ranging from practically nothing to 320 lb. per acre of improved farm land, and from no outlay at all up to \$2.75 per acre. As most soils if diligently farmed will sooner or later come to respond profitably to an application of a nitrogenous fertilizer, we may expect the non-consuming districts eventually to become consumers, and more promptly, but not as extensively, the present consumers to increase their demands.

In other words, our immediate market is with our present customers. Unfortunately, the best customers lie in the South, whereas the center of pig iron and ammonia production lies 700 miles away, somewhere near Chicago. Georgia, South and North Carolina, Alabama, Florida, Mississippi and Louisiana take over one-half of the fertilizer sold in the United States. On the other hand, the great farming regions north and west of Chicago take no fertilizer to speak of. In fact, as the center of farm lands and cereal production lies a little southwest of Chicago, this means that one-half of the United States farm area does not use fertilizers at all. This brings out a problem in the economical distribution of sulphate of ammonia.

We may gain some light on this question from the experience of other nations. Germany, by means of widespread and energetic propaganda, has increased her home consumption year by year to 425,000 tons of sulphate of ammonia, nearly twice our present figures. They have been forced to do this because the home production has increased annually by amounts from 40,000 to 70,000 tons, whereas our largest increase was that of last year, 38,000 tons, which will hardly be approached this year. Although Germany uses much more nitrogen from nitrate of soda and sulphate of ammonia, both per acre and per capita, yet we must not build too much on these figures. Germany has a population of 290 per square mile, while we have but 32, and in spite of her large use of fertilizers, her yields of the principal crops average only 50 per cent. more than ours. Intensive culture is with her a necessity.

The most hopeful indication is that, in spite of the increase in sulphate of ammonia and nitrate of soda production, and the advent on the market of the nitrogen recovered from the air, the price has been maintained with an upward rather than a downward tendency, aside from incidental fluctuations.

Regarding the use of benzol as a motor fuel, the case of a truck engaged in general city delivery work may be cited. On a six months' test with benzol alone as fuel, a gallon of benzol yielded 15 per cent. more work than a gallon of gasoline. Based on an equal number of heat units supplied, the efficiency was about the same.

Metallic Tapes with Instantaneous Readings

For the benefit of those not entirely familiar with the meaning of the name "metallic" as it is used in connection with measuring tapes, it should be said that this is the name applied to that class of woven tapes having, in addition to the linen threads, metallic strands interwoven, and it does not mean that the tape is made of steel or metal of any kind, as might be inferred. "Metallic" is the name applied to this class of tapes in general, and is not the name of any particular manufacturer's brand. Tapes of this kind have been on the market for years, and they are generally conceded to be the best grade of woven tapes.

The Lufkin Rule Company, whose factories are at Saginaw, Mich., has just placed on the market metallic tapes with instantaneous readings. This is a method of numbering the graduations of measuring tapes, and, described briefly, it means that in small figures, alongside each inch mark, the number of the last preceding foot mark is repeated. This renders it unnecessary to refer back to the last foot mark when taking a reading, avoiding this chance for error, and saving time.

Instantaneous readings is a Lufkin idea, applied at first only to the company's steel tapes, and in this connection it is widely known, being recognized as a great improvement in the marking of measuring tapes. The idea is now for the first time applied to metallic tapes, and all Lufkin metallic tapes are now being supplied with this new marking.

Some Interesting Steel Pipe Details*

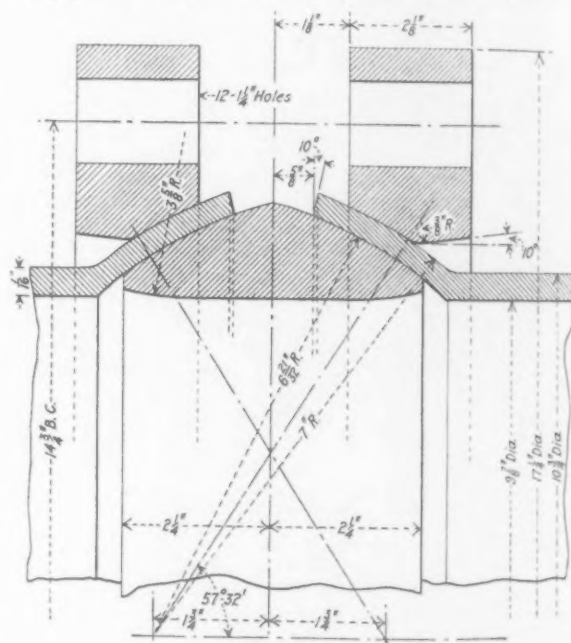
A Form of Universal Joint and
Oxy-Acetylene Welded Tees

BY JAMES B. SCOTT

In providing for the Baltimore high-pressure fire service, it was believed that cast-iron pipe was not a scientific application of material for the stresses involved. Commercial rolled steel lap-welded pipe meets the structural conditions much more satisfactorily. The pipes were thoroughly cleaned and heated to a temperature of 300 deg. F. and while hot were dipped vertically in the bath of asphalt, which was maintained at a temperature of from 350 to 400 deg. F. The pipe was held in the bath for a sufficient length of time and was then drawn out slowly, at the rate of 5 to 10 ft. per min., so that a coating of 1/32 in. thickness was evenly distributed over the entire surface of the pipe.

The specifications called for lap-welded pipe made of soft open-hearth steel having the following qualities: Carbon, not exceeding 0.10 per cent.; phosphorus, not exceeding 0.04 per cent.; sulphur, not exceeding 0.05 per cent.; manganese between 0.35-0.45 per cent. Ultimate tensile strength between 50,000 and 55,000 lb. per sq. in.; elastic limit at least 1/2 ultimate; elongation not less than 20 per cent. in 8 in.; cold and quench bend 180 deg. flat. The thickness of pipe, in inches, was as follows: 24 in. outside diameter, 1/2 in.; 16 in. outside diameter, and 10 in. and 8 in., 7/16 in. Bends were generally of a standard radius of five diameters of pipe. Length of pipe laid was: 24 in., 1275 ft.; 16 in., 17,052 ft.; 10 in., 28,229 ft.; 8 in., 7137 ft.; total, 53,693 ft.=10.2 miles.

A joint was designed to avoid altogether the necessity for a gasket or joint cement of any kind. The end of the pipe is flanged out into a bell forming a zone of a



Type of Pipe Joint to Avoid Use of Gasket

sphere. A soft cast-iron ring is accurately turned in the shape of a torus, having the same curvature on its exterior surfaces as the interior of the bell on the pipe ends. Loose flanges are placed on the pipe back of the bell, and when bolted up, draw the pipe bells up on the torus ring. The pressure secured by the wedging effect on the spherical surfaces is enormous. The joints are designed for a deflection of 10 deg., or about 3 ft. 6 in. in a 20-ft. length.

For make-up pieces at intersections and in blocks between valves or tees already installed, straight line welded joints were used. A special joint was devised for this service, made up as follows: The end of one pipe was accurately expanded sufficiently to permit of its being shrunk over the end of the pipe to which it was to be

*From a paper on the Baltimore high-pressure fire service system presented to the Baltimore meeting of the American Society of Mechanical Engineers.

joined. Holes were cut around the circumference of the outer pipe or bell, and after being heated it was shrunk on in place. The holes were then flowed up with metal by the oxy-acetylene blow-pipe, and the end of the bell was also welded to the enclosed pipe. With this type of joint the weld is in shear and not in tension, and it is entirely feasible to make bends in the pipe with the weld in the arc of the curve. Approximately 1500 of these straight line welds were made on the work, or about 150 per mile of pipe.

The hydrant branches were made by welding necks to the mains and laterals. A special neck weld was used, made up as follows: A hole was cut in the pipe, smaller than the size of the neck, and radial cuts were made forming four narrow lugs which were left projecting into the hole. The wider alternate lugs were bent back to make an opening large enough to receive the neck piece. The smaller straight lugs formed a support for, and held the neck rigidly in place during the welding process. The whole joint was then flowed with metal by an oxy-acetylene blow-pipe, forming a joint as strong as the original pipes.

For field tests during the installation of the pipes, the contractor furnished a portable testing set consisting of a 3-hp. 4-cycle gas engine, driving through a Morse chain a triplex plunger pump of a capacity of 5 gal. per min. at a pressure of 1000 lb. per sq. in. Each street section between valves was tested as the work was installed, and made absolutely tight, at the specified pressure of 600 lb. After the pipe lines had been completed, but before the system had been put into commission, a pressure of about 800 lb. was put on the pipe lines by the main pumps. A suggestion was made to close the pipe system off from the pumps to determine how long the pressure would remain. The main 24-in. valves were accordingly closed, while the pressure was at 125 lb. After a lapse of 16 hours the gage registered 95 lb., indicating that the leakage was practically nothing.

Contracts for the hydrants and high-pressure water



Tee Made in Field by Oxy-Acetylene Welding

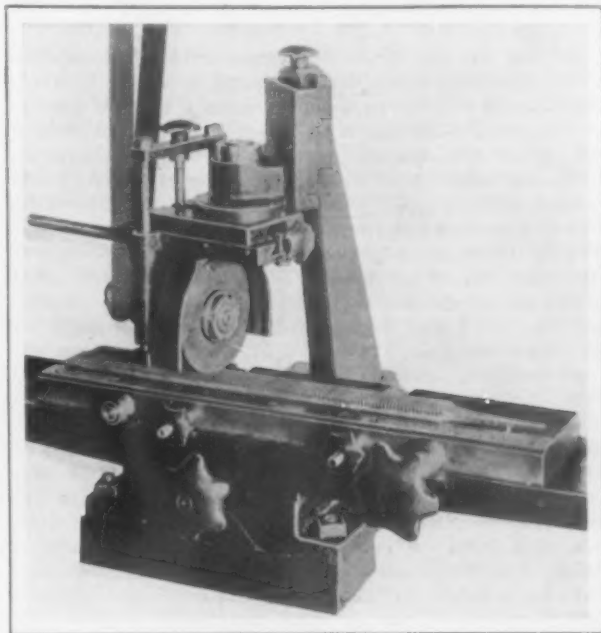
pipe lines were awarded to the Pittsburgh Valve, Foundry & Construction Company, of Pittsburgh. Many of the working details of the system were designed by J. Roy Tanner, chief engineer, and Charles Fitzgerald, superintendent of construction for the contractor.

According to a report of the German consul at Khar-kov, the production of manganese ores in the Nikopol district of southern Russia last year reached 234,000 metric tons, or 12,400 tons more than for 1911. While the amount sold last year increased only 18.6 per cent., the exports gained 48.6 per cent., a fact which leads the consul to remark that the ore trade there will apparently give more attention to the export trade in future. Almost one-third of the product last year was sent abroad.

The surveying of Gary harbor No. 2, Gary, Ind., has been halted by the announcement of the United States Steel Corporation that it needs the site for plant extension.

Resharpener Files Like Milling Cutters

In the manufacture of its curved tooth file by the Vixen Tool Company, Philadelphia, Pa., each tooth is cut separately on milling machines. This process, it is stated, makes it possible for a process of direct resharpener similar to that in practice for milling machine cut-



A New Method of Resharpener Files Employed by the Vixen File Company Which is Practically the Same as That Used for the Cutters of Milling Machines

ters to be employed. In manufacturing, each tooth is milled separately and in resharpener each tooth is ground separately by a fine grinding wheel operating in an arc to conform with the curve of the tooth.

A swiveling grinding head carrying a fine grinding wheel and a sliding table on which the file to be resharpener is held are the essential parts of the device. With the left hand, the operator swings the wheel around through each tooth separately, while with the right hand, the file is moved along from one tooth to another as each is resharpener. The feeding movement is controlled by a wheel on the sliding table, and the projection at the left of the grinding head controls the wheel. The resharpener operation, it is pointed out, makes the file practically new and can be repeated from four to six times before the file must be discarded or recut. The sharpener is made in but one size, but this is adapted for the various sizes and grades of files commonly used.

The Increase in Swedish Ore Exports

Our German correspondent furnishes the following information:

Further details are at hand with regard to the Swedish Government's plans for increasing the export of ores. The contract calls for a total increase of 31,000,000 tons up to the end of the year 1932. The increase will be distributed on the following plan: In 1913 there will be an increase of 300,000 tons; in 1915 650,000 tons; then rising yearly until a maximum increase of 1,900,000 tons will be reached in 1921, after which the rate of exports will remain fixed. Toward the end of the period covered by the arrangement exports will run to 6,420,000 tons a year.

The Swedish Government's report on the matter says that the available supply of ores in the Kiruna district had hitherto been estimated at 480,000,000 tons, and in the Gellivara district at 50,000,000 tons, a total of 530,000,000 tons. Later investigations, however, made since 1907, show that there are 740,000,000 tons in Kiruna and 233,000,000 tons in Gellivara, making a total of 973,000,000 tons for the two districts.

The Quigley Furnace & Foundry Company, Springfield, Mass., moved its New York office June 2 from 50 Church street to 26 Cortlandt street.

The Microscope in the Iron and Steel Industry*

What Metallography Has Done in Revealing Physical Properties of Steel and in Indicating Heat Treatment

BY ALBERT SAUVEUR†

It was in 1891 that the management of the South works of the Illinois Steel Company at South Chicago, Illinois, had the courage and foresight to take up the microscopical examination of the products of the mills, a task which was entrusted to me. It was a courageous move because very little had been done at the time and because metallography was then held in little esteem by iron and steel producers and consumers, it being considered by them as an occupation possibly of some scientific value but of no possible practical application. That it was an act of foresight has since been fully demonstrated. Sorby had then published his classical paper on the "Microscopical Structure of Steel" (Journal Iron and Steel Institute, I, 1886), Osmond and Wert had described their "Cellular Theory of Cast Steel" (Comptes Rendus Académie des Sciences, 1883, and Annales des Mines, 1885), Osmond had published his "Transformations of Iron and Carbon" (Mémorial de l'Artillerie de la Marine, 1887), his "Etudes Métallurgiques" (Annales des Mines, 1888) and his note on "The Critical Points of Iron and Steel" (Journal Iron and Steel Institute, I, 1890), Howe's epochal treatise on the metallurgy of steel was fresh from the press and contained an excellent critical review of Sorby's work and finally Martens had written several articles on metallography.

The Beginnings of Metallography in America

That was the extent of metallographic literature when the subject was taken up at the South Chicago plant of the Illinois Steel Company. And to the best of my knowledge Professor Howe was then the only American devoting any time to the microscopical examination of iron and steel. Our progress, however, was encouraging from the beginning and the work was actively carried forward for five years, when, owing to unavoidable circumstances, it came to a sudden stop. But a substantial start had been made on sound foundations, and further progress was not to be stopped. Each year since has seen notable advance in the development and usefulness of metallographic methods, each year has seen new recruits added to the ranks of those earnestly interested in the subject and new additions to the list of industrial establishments utilizing the microscope and the methods of metallography for the conduct of their operations until today in the United States alone the microscope is used in more than 350 metallurgical establishments, including practically every steel mill of importance, while the subject is taught in practically every scientific or technical school. Had not the early start to which I have alluded been made, it is quite possible that instead of leading the metallurgical countries in the extent of the application of the microscope to metallurgy, we might occupy a much less enviable position.

In the early days of iron and steel making some rough tests were applied to the finished or semi-finished articles in order to ascertain their physical properties, namely, their strength or weakness, ductility or brittleness, hardness or softness, and the early metallurgist had to be satisfied with these crude means of estimating the quality of his products. The mechanical tests have been gradually improved until today the strength, ductility, elasticity, hardness, resistance to wear, to shocks, to repeated stresses, to alternate stresses, etc., can be measured with great precision and the results yielded by these highly developed testing methods are of the greatest value to the producer and consumer as well as to the engineer. No matter how refined the method of physical testing, however, and no matter how great its accuracy, the information it conveys while very illuminating in indicating whether or not a certain steel is suitable, for a

certain purpose or whether it is better than another steel, it rarely enlightens us as to the manufacturing modifications needed to produce the desired results, and rarely points unmistakably to the factor or factors responsible for failure. Whatever it can do for us in these directions is done in an indirect, empirical way.

The Microscope Adds Needed Information to Analyses

[At this point Mr. Sauveur discusses the limitations of the ordinary chemical analyses of steel in revealing the causes of the varying physical properties of pieces of steel of the same composition and states that a much closer relation must exist between the properties of a substance and its proximate composition than between those properties and its ultimate composition. He then shows clearly by photomicrographs how physical properties of steels of the same composition depend upon the crystalline structure resulting from heat treatments and can only be explained and understood thereby and how by means of the microscope the physical properties can be predicted very accurately. The author continues:]

To sum up, we have [in photomicrographs which the author exhibited] the characteristic structures of the same steel which has been subjected to three well-defined treatments, namely: 1. Pearlitic steel produced by slow cooling through the critical range and possessing maximum softness and ductility but deficient in tenacity and elastic limit. 2. Sorbitic steel produced (a) by hastening the cooling through the critical range or (b) by first hardening the steel and then reheating it to above 400 but below 700 C., more tenacious and harder but less ductile than pearlitic steel. 3. Martensitic steel, produced by very rapid cooling from a temperature exceeding the critical point, hard, brittle and deprived of ductility. While these three typical structures with their corresponding characteristic properties are obtained by sharply defined and well-understood treatments, it will be obvious that the steel may be subjected to intermediate treatments and that these should yield intermediate structures and properties. In other words, we readily conceive the production of pearlitic-sorbitic and of sorbitic-martensitic steels having properties intermediate on the one hand between pearlitic and sorbitic steels and on the other between sorbitic and martensitic steels. As a matter of fact, so sensitive is steel to heat treatment that innumerable structural condition may be produced, binding together through a gradual transformation forming an unbroken chain, the pearlitic with the sorbitic steels and the latter with the martensitic steels.

The Law of Ductility and Brittleness

From a knowledge of the proportions of pearlite, sorbite, martensite, free ferrite and free cementite present in the steel we are able to foretell with a fair degree of accuracy the treatment received by the metal as well as its physical properties, while a knowledge of the percentage of carbon does not convey any information as to the treatment received and enables us only to infer what the properties of the metal might be after certain industrial treatments.

While the proximate composition of steel, or what we may call its structural composition, bears a much closer relation than its ultimate composition to its physical properties, I now propose to show that even from a knowledge of the structural composition we cannot predict the physical properties with absolute certainty. In other words, two pieces of steel may have the same structural composition—let us say the same proportion of ferrite and pearlite—and still differ materially as to certain of their properties. The difference, to be sure, will not be of the same magnitude as that existing between pearlitic and sorbitic steel, but it may be nevertheless sufficient to affect greatly the engineering value of the steel. There

*Synopsis of a paper read at the New York meeting of the American Iron and Steel Institute, May 23, 1913.

†Harvard University, Cambridge, Mass.

must be, then, another factor which influences the properties and which I have not yet considered. Who does not know that the properties, let us say the strength and ductility, of a chemically pure metal, are not always the same? Take copper, for instance—chemically pure copper—its tenacity varies greatly according to the conditions in which we test it, namely, whether in the cast, cold drawn or annealed condition. And still its approximate as well as its ultimate composition necessarily remain unchanged. The explanation for these marked variations of properties corresponding to identical proximate composition is found in the consideration that metals are crystalline substances and that their properties are affected by the dimensions and form assumed by the crystals or crystalline grains of which they are made up. Generally speaking it is true to say that the smaller the crystalline grains the more ductile and less brittle the metal and that a grain distorted (elongated) by cold working generally increases the elastic limit (and often the tenacity) while it decreases the ductility.

Conclusion

When dealing with steel, therefore, it is not sufficient to inquire into the kind and percentages of the structural constituents; we must also consider the grain of the metal, namely, the dimensions and forms assumed by those constituents. Fortunately, here again the microscope comes to our assistance for it does more than reveal the structural composition of metals—it is a true dissecting instrument which lays bare their anatomy; that is, the physical grouping of the constituents, their distribution, relative dimensions, etc.

The very great difference between the properties of gray cast iron and those of malleable cast iron affords a striking example of the influence exerted by the form and mode of distribution of the constituents, for both those metals may have conceivably the same structural composition; that is, they may be made up of the same percentages of ferrite and graphite. In gray cast iron, however, the graphite occurs in sharp, curved, irregular plates so thoroughly breaking up the continuity of the soft, ductile ferrite as to greatly weaken it and destroy its ductility, while in malleable castings the graphite occurs as rounded particles and in this form is much less harmful, the ferrite retaining considerably more of its tenacity and ductility (or malleability as this relatively small amount of ductility is wrongly called).

Discussion

By Bradley Stoughton, Consulting Engineer

Professor Sauveur has modestly omitted all mention of his own part in the development of the practical value of the microscope in the steel industry, and I shall do no more than refer to it here, first, because it is already well known to most of you, and, second, because an account of it would take all of the time available for my discussion of his paper.

There are only two reasons, it seems to me, why metallography is not a universal means of test in iron and steel works. The first is that some manufacturers are content as long as they are making steel and making money, even if they are not making as good steel or as much money as others are doing. Secondly, the reputation of metallography has suffered through the sometime lack of truly expert work—the right man has not been in his place. We would not have a ship piloted into New York harbor under the guidance of the admiral of the fleet, and, by the same token, a wise steel maker or expert metallurgist will often get into shoal water when a good metallographist, who is working always in the same narrow field will bring us to a satisfactory solution by following signs and indications which the other never sees.

What Metallography Will Do

Metallography will not supplant care and skill in manufacture; it will not supplant other standard tests and safeguards. But it is an important additional safeguard which, we think, will be admitted to be indispensable to meet modern competition in some lines, as, for example:

To make high-grade steel, such as tool steel, alloy steels, etc.

For case-hardening and all heat treatment.

To make good steel better and to make good steel good a great part of the time, with minimum of failures.

To make cheap steel without having it so bad as to be rejected.

To discover and prevent certain defects, such as occluded slag, sulphides, alumina and other oxides, segregation, blowholes, etc.

To explain why steels of apparently good quality by the indications of other tests, yet fail in service, or at least in certain types of service; why some wire becomes brittle during pickling and other wire does not; why some practices in wire-drawing unfit the product for tension cables; why some files are so much better than others, etc., etc.

For the users of wrought iron and charcoal iron metallography is the only reasonable safeguard against fraud. Malleable cast iron manufacturers employ it with advantage, both technically and commercially, while the manufacturers and users of cast iron are to understand, with the aid of the microscope, something of the great complexities of their material.

Knowledge in Advance of Tests

Our technical world has recognized that the structure and state of aggregation, the mode of occurrence and the form of the constituents of iron and steel are of more importance in their effect on quality than are the constituents themselves, and that, for a knowledge of these conditions, chemistry and the unaided eye are only crude guides at best.

To-day a good metallographer can predict many things in advance of a test. He can not only give a good estimate of the chemical composition, including some things, such as oxygen, combined carbon in cast iron, and others which analytical chemistry is only beginning to accomplish in a commercial way, but he can go farther and predict that steel will break with a cup fracture, a silky, a fibrous, a laminated, a crystalline, a fiery fracture, etc. But this, like other expert microscopic work, requires a good, steady pilot working in one field all the time, rather than your sea captain or admiral, who gives his attention to interpreting the revelations of the microscope only when some emergency justifies his taking it away from a broader and more general field.

A Traction Engine of Novel Design

A four-wheel traction engine, in which the weight is equally distributed on all wheels and both axles turn in going round corners, has been brought out by the Herr Engine Company, Portsmouth, Ohio. The power plant is a self-balanced two-cylinder opposed engine, operating on the four-stroke cycle, and the power is transmitted through a pinion and large cut gear to a cast-steel gear case under the center of the frame. From here it is transferred to differentials on both the front and rear axles through chains, and all four wheels are driving wheels.

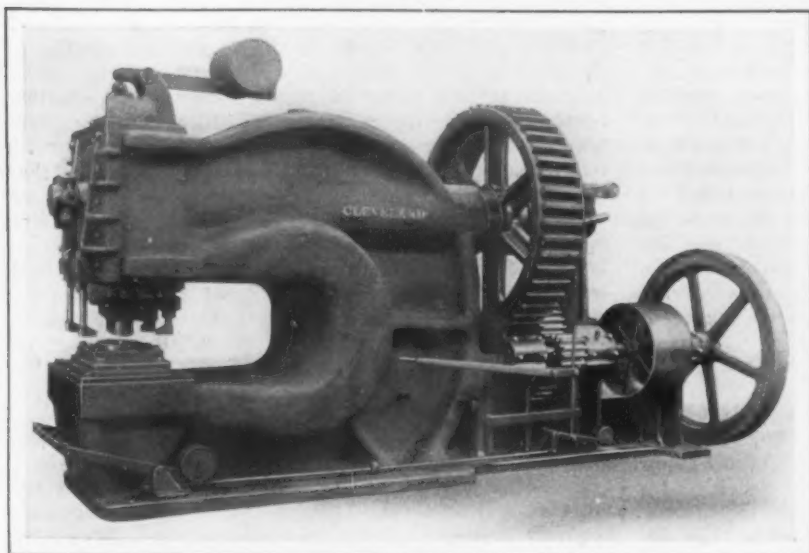
The novel feature making possible this arrangement is that the turning points and steering control of both the front and rear axles are arranged so that each axle turns through the same angle when cramping, and thus the rear wheels track after the front ones and the distance traveled by both pairs is equal. The minimum radius of the inside wheel of a 25-hp. engine is only 8 ft., so that short turns can be made.

A lattice construction is used for the face of the wheels, so that soft mud squeezes through and allows the cleats to reach a solid footing. Three forward speeds ranging from 1.6 to 4 miles per hr. are available, and there is one reverse at the rate of $2\frac{1}{4}$ miles per hr. All speed changes are accomplished by shifting a single lever in the cab. In addition to tractor work the engine can be used for running concrete mixers and stone crushers through a belt.

The amount of water required for cooling blast furnace gas was incorrectly stated in the report of the meeting of the American Society of Mechanical Engineers in Baltimore, on page 1292 of *The Iron Age* of May 29. It should have been stated that with a temperature of 500 deg. F., the reduction of temperature of the gas to 86 deg. requires about 31 gal. of water per 1000 cu. ft. of gas. The figure as printed was 100,000 cu. ft. of gas.

Large Boiler Plate Punching Machine

An unusually large punching machine has recently been built by the Cleveland Punch & Shear Works Company, Cleveland, Ohio. It is a 48-in. open gap machine and is



A 48-In. Open Gap Punching Machine for Making Boiler Manhole Openings

designed for punching out $6\frac{3}{4} \times 12\frac{1}{2}$ in. manholes in $1\frac{1}{2}$ -in. boiler plate at the plant of the Dillon Steam Boiler Works, Fitchburg, Mass. The machine has a 3-in. stroke and will punch 4-in. holes at the rate of 18 per min.

The bed of the machine is a semi-steel casting, having a tensile strength of 30,000 lb. per sq. in. and weighing approximately 60,000 lb. The jaws are 30 in. wide and 28 in. deep, and the distance between them is 24 in. There is a cored hole in the lower jaw measuring $18\frac{1}{2} \times 24\frac{1}{2}$ in. The cover plate is of cast steel thoroughly ribbed and is tongued with four tongues and hooks around the head of the frame. The plunger, which is a massive steel casting, measures 12×24 in. in section, and has three T slots with a center slot to receive the tongue of the upper blocks, an arrangement, which it is emphasized, assures perfect alignment. The movement of the plunger is counterbalanced with a spring counterweight.

The die and die blocks are designed so that the dies can be easily changed. To remove the deep-flanged heads the dies and die block can be removed without disturbing the lower cast-steel bolster, punch or strippers. The bolts in the die and blocks are fitted so as secure perfect alignment. Four strippers are furnished which can be easily removed or adjusted.

The machine is driven by a 30-in. pulley with an 8-in. face through a train of main and intermediate gears. The main gear is double shrouded and has cast teeth $16\frac{1}{2}$ in. wide. It is bronze bushed on the main shaft and the main pinion is of steel with cast teeth. The intermediate gear and the pinion meshing with it are of steel with cut teeth. The flywheel is 66 in. in diameter and weighs 2800 lb. The main, intermediate and flywheel shafts are of oil treated high tensile polished steel and are finished to exact size. The machine is controlled with a foot treadle that extends around the jaw and a hand lever is provided at the back of the throat.

The machine weighs 93,000 lb. and has an approximate shearing capacity of 2-in. plates. The floor space required by the machine measures $6\frac{1}{2} \times 17\frac{1}{2}$ ft. and the over-all height is 9 ft. The depth of the gap is $49\frac{1}{2}$ in. and the distance between the lower jaw and the plunger when the latter is up is $20\frac{1}{4}$ in.

A protest against the proposed 20 per cent. duty on sprocket chains has been made to Congress by the chain manufacturers, one of the largest being the Diamond Chain & Mfg. Company, Indianapolis. L. M. Wainwright, president of the company, says a reduction of the duty from 45 per cent. to 20 per cent. will give foreign producers all the larger business in this country, on account of the lower cost of steel abroad, the longer hours of chain workmen and their smaller pay.

A Swing Hammer Pulverizer for Laboratory Use

For laboratory use in reducing different materials to a fine, uniform product for various purposes, the Jeffrey Mfg. Company, Columbus, Ohio, has brought out a swing hammer pulverizer. It is pointed out that the machine is especially useful in sampling coal and various ores, since it not only reduces the sample to a comparatively fine powder, but thoroughly mixes it into a homogeneous mass. One of the special fields for which it is adapted is in industries where a heavy duty or large capacity machine is not required. This machine can be mounted on timber on an ordinary wood floor, as would be necessary in placing it on one of the upper floors of a factory building, a solid concrete foundation not being required.

This machine can be furnished for a belt drive, as shown in the accompanying engraving, or it may be mounted on a cast-iron base with a direct connected motor. In the sampling of coal, an arrangement of a large auxiliary hopper and a sampling chute is recommended by the builder. This auxiliary hopper is large enough to hold a batch of material, the discharge opening be-

ing closed by a sliding valve. When this valve is opened the material passes into a second hopper, which is connected with the hopper of the machine, and into which material



A Laboratory Pulverizing Device Operating on the Swing Hammer Principle and Designed for Reducing Coal, Ores, Etc., to a Fine Powder.

can be shoveled without regard to the large auxiliary hopper. As the ground material passes out of the pulverizer it is caught in a sampling chute below, the first section of which rejects half of the material. The second section of the chute is placed at right angles to the first and rejects half of the material passing through the first one, four chutes in all being used, so that but one-sixteenth of the original material is delivered at the bottom.

The Dominion Bridge Company, Montreal, Canada, sells stock of the company to its employees on the installment plan, but, unlike most companies, reserves to itself the profit that may accrue over the purchase price of the shares should the employees dispose of them. The Royal Trust Company holds 2740 shares for that purpose.

Sixty-four per cent. of the steam railroads in Indiana and 22 per cent. of the interurban mileage have block signals. The Grand Trunk Railroad unsuccessfully attacked the constitutionality of the State law requiring such systems.

Judge Gary Testifies for the Corporation

Tells How the Steel Corporation Was Organized—Gives Details of First Meetings—His Responsibility for the Project

On Tuesday, May 27, Chairman E. H. Gary was called just before the close of the hearing. He smiled when asked by R. V. Lindabury, counsel for the United States Steel Corporation, to outline his business career, and said:

I was born on a farm and worked on a farm, subsequently studying law and practicing in Chicago for a good many years. I became actively connected with the steel business at the time of the completion of the organization of the Federal Steel Company, when I was elected its president.

I had been general counsel for the Consolidated Steel & Wire Company in the early nineties, and was a director until 1898. I was general counsel for the Illinois Steel Company from 1895 to 1898, and a director for a year or two before 1898. I afterward became general counsel and a director of the American Steel & Wire Company of Illinois, but when the American Steel & Wire Company of New Jersey was formed I dropped out.

Why the Federal Steel Company Came to Be Formed

Q. You were actively connected with the organization of the Federal Steel Company, were you not? A. Yes. I did practically all of the legal work and conducted most of the business negotiations.

Q. Were any of the companies you combined in competition? A. They were not, except that the Lorain Steel Company had a mill for the manufacture of girder rails and could manufacture, but not economically, standard rails. That was the only respect in which it could be called a competitor of the Illinois Steel Company. No company that went into the merger, other than the Lorain, made girder rails.

Judge Gary said he considered the capitalization of the

Federal Steel Company moderate. It had an authorized capital of \$200,000,000, of which \$100,000,000 was issued. The value of the companies acquired, which included manufacturing, railroad, and ore properties, was about \$56,000,000. To this was added \$31,000,000 as the estimated actual value of the properties above their book value and \$14,000,000 of new capital provided by the syndicate. He continued:

The Illinois Steel Company had been struggling along for a good many years without making much headway, because of lack of capital, inadequate facilities, imperfect organization, and lack of features to make it a self-contained or complete manufacturing plant. It had not been successful and did not pay dividends.

During the summer of 1898 there was a good deal of discussion among the directors as to the desirability of securing additional properties as a means of successful manufacturing steel. It was decided that it was necessary to make substantial additions. In June, 1898, a proposition was made by some of those interested in the Elgin, Joliet & Eastern Railroad to sell it to the Illinois Steel Company, which had its own terminal road extending into Indiana and connecting with the trunk lines. This would furnish a connection between the plants at South Chicago and at Joliet.

Judge Gary said he told the people who broached this sale that it would hardly be worth while unless a general combination was made, including the Lorain Steel Company, the Minnesota Iron Company, and other properties which would equip the new company with ore lands, transportation, and other mills.

How the Federal Led Up to the Greater Combination

Continuing his testimony on Wednesday, Judge Gary stated that soon after a meeting of the executive committee of the Illinois Steel Company was held in New York. Nathaniel Thayer had told of an interview with H. H. Porter, a dominant factor in the Minnesota Iron Company, who was in New York to attend a meeting of his company, and as a result of this and other conversations with Mr. Porter and with Governor Flower, who was interested in the Minnesota Company, committees were appointed representing the several companies suggested to enter the contemplated consolidation as recommended. These committees, including Messrs. Thayer, Brown and Bacon, of the Illinois Steel Company, and Messrs. Porter, Flower and Seibert, of the Minnesota Iron Company, met at the Holland House in New York.

The accountants of each company had examined the books of the other, so that there was a basis for discussing valuation, and when a motion was adopted that the two corporations should combine, H. H. Rogers, who was interested in the Minnesota Iron Company, and who had a little interest in the Illinois Steel Company, was selected to decide a basis for the amalgamation. Accountants from both companies presented their valuations to Mr. Rogers, and later in the evening he reported to the meeting the figures at which each company should be taken over in his opinion. These figures were later used as a basis on which the Federal Steel Company was organized. After the report of Mr. Rogers had been adopted a committee was appointed consisting of Governor Flower, Senator Spooner, Robert Bacon, and Judge Gary, with full power to put these companies together and purchase other companies, if in their judgment it was deemed advisable. The work was done by Mr. Bacon and Judge Gary, as the other two of the committee did not act.

Answering a question of Mr. Lindabury, Mr. Gary said that the Minnesota Iron Company was the pioneer in opening up the Mesaba Range, adding, "I believe that this company could have purchased the whole of the Mesaba Range at one time had it so desired." He continued:

The owners of the Lorain Steel Company were desirous of selling. They offered it for sale several times to my personal knowledge to other people. Tom Johnson was one of the negotiators. The company was taken in by the Federal Company after considerable investigation, the property being considered advantageous on account of its location, for export as well as domestic business. We expected the Erie Canal and the Welland Canal would be enlarged and that we would have water transportation from the plant direct to the ocean.

Federal Steel Company Far From a Monopoly

Mr. Lindabury recited the Government charge that not only was it the purpose of those who organized the Federal Company to acquire a monopoly and restrain trade, but that such was the effect of the organization. Mr. Gary denied this emphatically. He said:

It was not—it was a strictly business proposition. The principal object of the Minnesota Iron Company was to dispose of its ore, and of course to transport it. The Illinois Steel Company and the Lorain Steel Company were necessarily purchasers of ore, and both of them became permanently fixed with respect to their necessities, so that that was perhaps one of the original motives in the minds of the directors of the respective companies. But as far as the leading interests are concerned, which included the gentlemen I have mentioned, and came to include myself as I got into this and took up the different negotiations and became really, to a large extent at least, the business manager of this organization, as well as one who did the legal work in organizing the company, I know that the objects and intentions were, as I have stated, to form a rounded out and practical organization, which it was believed at that time would produce and distribute to the best advantage and at the least cost, and increase the business at home and abroad.

Judge Gary went on to speak regarding the results accomplished:

The plans were good so far as they went, but the organization was too small; the capital employed was too

(Continued on page 1394)

ESTABLISHED 1855

THE IRON AGE

Published Every Thursday by the

David Williams Company
239 West 39th Street New York

W. H. Taylor - *President and Treasurer*
Charles G. Phillips - *Vice-President*
Fritz J. Frank - *Secretary*
M. C. Robbins - *General Manager*

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Charles S. Baur - *Advertising Manager*

Branch Offices

Chicago: Otis Building Philadelphia: Real Estate Trust Bldg.
Pittsburgh: Park Building Cleveland: New England Building
Boston: Equitable Building Cincinnati: Mercantile Library Bldg.

Entered at the New York Post Office as Second-class Mail Matter

Subscription price: United States and Mexico, \$5.00 per year; to Canada, \$7.50 per year; to other foreign countries, \$10.00 per year.

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The Railroad Demand for Increased Rates

It is well to note carefully that the demand of the Eastern roads for a general 5 per cent. increase in freight rates comes no less than three years after the general demand, the refusal of which by the Interstate Commerce Commission marked an epoch in its administration of affairs. The former demand took concrete form about this time in 1910, being held up temporarily by President Taft's action in threatening prosecution under the Sherman law, and an agreement was reached to postpone the filing of advanced tariffs to await the increased powers of the Commission contemplated by the legislation then pending. Upon the eventual filing of the advanced tariffs, the Commission placed them in the two famous cases, the one referring to "official classification territory" and the other to the Western roads. Adverse decisions in both cases were handed down February 22, 1911, two years and three months ago.

At the time of those decisions it was admitted almost universally that it was at most a case of "not proved" under existing circumstances, but in any event it must be admitted that the time elapsed may now have changed the situation entirely.

One of the vital issues in the question of rate advances is the extent to which the public may claim returns through the economies that the world's progress permits the railroads to practice. In certain quarters there has been a violent effort to focus attention upon alleged economies which the railroads do not practice but which it is claimed they could practice. The whole issue having been made purely controversial, no one has undertaken to measure the economies which the railroads have introduced. The railroads do not emphasize the progress they have made, fearing they might then be asked to get along in the circumstances, while their critics have been too anxious to score points, at whatever expense, to do so. Nevertheless, it remains obvious that, measured in terms of mental and physical effort expended and materials consumed, the railroads have effected wonderful economies. Otherwise they could not live under present conditions, with the great advances in wage rates and in commodity prices that have occurred.

In substance, there is now bargaining between the railroads and the people as to what the railroads should charge the people for the services rendered, but, as we are in a transition stage, it is not settled how much either party may claim for its own of the advances that have been made. These advances fall into two general classes: 1. Those occurring through the introduction of economies by the direct initiative of railroad managers, such as the increase in train loads. 2. Those occurring through the development of the country, such as the increased density of traffic. A definite analysis is required as to how much of the fruits of these developments should inure to the railroads and how much should inure to the public.

Despite these and other broad fundamental questions which are at issue, the more common viewpoint is that of what the railroads are earning. If their earnings are improved, then they should be content; but this dictum loses sight of the fact that if earnings decreased many obstacles would be found to the admitting of rate increases on that ground. For instance, so facile are railroad critics that the argument might be urged that the decreased traffic was due to inability on the part of the public to pay existing rates.

Viewed with proper allowances, however, the railroad showing as to earnings has important significance. The latest comprehensive statistics are those for March of the Bureau of Railway Economics and those for February of the Interstate Commerce Commission. On account of the floods in March the earlier statement may perhaps be the better to consult. For the eight months ended February, 1913, are shown uniformly distributed gains in total revenue, operating expenses, and net operating revenue, per mile of line, as compared with the similar period ended February, 1912. Total operating revenues increased 10.2 per cent., operating expenses increased 9.1 per cent. and net operating revenue 12.5 per cent.; so that there was a slight improvement in the operating ratio. Comparing the eight months ended February, 1912, with the eight months ended February, 1911, there were very slight losses, so that the eight months ended February, 1913, compare very favorably with the eight months ended February, 1911, the former period being precisely the period during which the "advanced rate cases" were pending. The showing is suggestive that in the present case the railroads will have occasion to use a different line of argument. They may possibly be able to make a better plea by insisting that they have some inherent rights left than they did in the former case by urging the mere plea of poverty.

The Tariff and the Patent Law

When Great Britain introduced the compulsory working clause in its patent law several years ago, its manufacturers claimed that as a free trade nation this amendment to its system was wholly logical, because of the industrial protection involved. On the other hand it was argued that the United States, being strongly guarded as to its industries by the tariff, had no need of this additional barrier. The inference was that so long as our tariff remained protective this country could have no need of a clause in its patent laws compelling the citizen or alien holder of an American patent to work the invention or issue a license to others to work it, or forfeit the patent altogether. With the tariff scaled down to one for revenue rather than protection the contention of the Englishmen has a bearing on the approaching changes.

A compulsory working clause in our patent law becomes a more vital need than has heretofore been the case. As has been pointed out from time to time the American inventor or the assignee of his patent, to be protected abroad, must either use the invention on a commercial basis in foreign countries or permit others to do so. As a consequence branches of American industries have been built in other parts of the world and foreigners are manufacturing important inventions under royalty.

The experience of the alien inventor in the United States is entirely different. He is treated with extreme liberality. Although under treaty rights a patent must be issued him here by the United States, he need never manufacture the invention here nor permit others to use it. His own country receives the exclusive advantage of the idea, excepting that most other foreign countries compel him to work the invention in their territory. The United States alone is excluded, because she alone has not adopted the principle. The result is that foreigners supply to Americans the results of many inventions protected by American law against our citizens.

Some opposition has arisen in this country to the principle of compulsory working, since if it were enforced domestic patents could not be locked up and inventions permitted to lie idle. But many manufacturers believe that if the United States will protect an inventor, rewarding him for his original ideas by insuring him their fruits, then he should be willing to give the world the benefit of his creations, for the common good. Products under unused American patents issued to foreigners are purchased from abroad to constitute parts of our manufactures, and we are paying duty on articles which would be made here were foreign inventors treated as they are in other countries. To amend the patent law would be some compensation for the handicaps to manufacturers which may result from the drastic provisions of the tariff bill.

A Correspondence Suggestion

Prompt attention to correspondence is a most important matter with every business house. The larger the concern the greater is the necessity for quick service in answering communications. To insure speedy attention, however, assistance can be rendered by those who write to the firm or company. If the letter is of such a character that it obviously needs to be referred to some particular department of the establishment, care should be taken to add to the address the department having charge of such business. If it is a reply to a letter from the firm or company, attention will be facilitated by placing on the letter or envelope the name of the individual who sent the communication, using such a form as "Please refer to Mr. —," or "Attention of Mr. —," or, if the letter gave a file number, that should be incorporated in the reply.

Every establishment whose mail is large places the work of opening and distributing letters in charge of some particular individual who, of course, does this work as expeditiously as possible, simply glancing at the letters to see to whose care they should be assigned. Much of his time would be saved and a great deal of annoyance to heads of departments would be avoided by having the directions given in the foregoing paragraph carried out. We have known instances in which a messenger has been obliged to spend considerable time in traveling with a letter from one department to another in the effort to find the person who had attended to some business matter regarding which a further question had arisen and was brought up in a new letter.

We are having this sort of experience ourselves. In the remote past, it was not difficult to place at once in the hands of the proper person a letter addressed to this establishment. With the growth of our business the work has necessarily been so divided and subdivided that the task of distributing the mail is one requiring an intimate knowledge of the office and of the character of work performed by possibly 25 individuals. It will be seen that to determine to which one of these a letter addressed simply to the David Williams Company should be assigned entails no little discrimination. If a letter in reply to one from this office is not simply addressed to the David Williams Company or *The Iron Age* but also carries with it the name of the individual writing the letter from this office it would immediately reach the proper party and the business of the office would thus be facilitated. We can appreciate from our own troubles

how time can be lost and much vexation occasioned by the addressing of letters merely to the name of a large firm or company.

Systematizing Details of Management

One measure of the efficiency of a manager lies in his ability to place upon others the responsibility for details of routine that may constitute distractions from which his mind should be free. Yet every day some of these matters must come to his attention, and an essential element of system is that they be presented to him with automatic certainty. The memory must not be relied upon, for it often happens that the factor of forgetfulness is high where a brain is employed under conditions requiring concentration.

The general manager of a large factory employing about 1000 hands and manufacturing a complicated product has evolved a system which permits him to forget for the time being every detail of a subject as soon as he is through with it, yet insures that it shall be brought to his attention again at a given time. Every morning memoranda of matters which are due for his consideration are laid on his desk. One batch, for example, included the various items of the spring cleaning about the works, with such details as repair of fences, painting, cleaning out under loading platform and in other places where rubbish might have accumulated in the winter, and so on. He was enabled to give the necessary directions for the carrying out of this work and for several other matters represented by a dozen or more slips. Where it was desirable, these went back, with notes added by the manager, to the follow-up system, to make records which in due time would appear in the office. Such a system secures complete orderliness. Wasted effort is eliminated. Certainty is created that no misfire of memory shall occur. Also, in the absence of the manager, his assistant has in hand information of each day's routine, instead of being more or less at sea as to the duties which he should perform.

Old Smoke Breeders Still Active

At one of the many meetings which are being held in American cities to consider the abatement of the smoke nuisance, the pointed suggestion was made by an engineer that a great fault in this connection is the unsound design of fireboxes and power-house chimneys. Broad, capacious fireboxes, heavily built up with brick, provide for the retention of heat, giving the high temperatures which insure better combustion. Many chimneys are inadequate in size of flues and in height. Observation of factory chimneys reveals a vast difference in the volume and density of the smoke. Occasionally a boiler house operates with practically perfect results, until the stack is given the additional burden of another boiler, when trouble begins.

Another suggestion, which like the first carries us back to the campaign of the early eighteen-nineties in Chicago, St. Louis and other cities, was that cities should enact ordinances providing that fireboxes, stacks and other details of design shall conform to given specifications as to size and construction for any given power. Expert steam engineers understand these conditions perfectly. Modern installations, correctly proportioned, especially where they are provided with mechanical stokers, seldom figure in connection with smoke troubles. Usually the fault lies with the older plants, which were either poorly designed or else have

been rendered imperfect by the increased demands upon them. One power house was a notorious offender until its old chimney was replaced with one of correct proportions. The change practically eliminated the smoke. This is typical of the possibility of improvement in a great many cases.

The Government Armor Plate Project

WASHINGTON, D. C., June 3.—Both House and Senate will probably conduct an investigation into the production and price of armor plate in this country with the object in view of ascertaining the feasibility of a Government plant to make the armor for American war vessels. Senator Ashhurst has introduced a resolution calling for an investigation, and Senator Tillman, chairman of the Senate Committee on Naval Affairs, introduced a resolution which has passed the Senate calling on the Secretary of the Navy for full information on the subject. Representative Borton, of Nebraska, yesterday, introduced in the House a resolution providing for an armor plate investigation. Senator Tillman's resolution, which will probably be the basis for the Senate investigation, is as follows:

Resolved, That the Secretary of the Navy be, and he is hereby, instructed to send to the Senate as soon as practicable the following information:

1. What is the cost of manufacturing the best armor plate per ton?
2. What would be the cost of erecting and equipping a plant for use by the Government in manufacturing armor and gun forgings?
3. Whether there is any secret or patented process or processes used in the manufacture of the best armor; and, if so, who own the patents.
4. How long would it take the Government to build and equip an armor plant adequate for the needs of the navy?

When the secretary has complied with this resolution the Senate Committee on Naval Affairs will probably make the necessary arrangements for a comprehensive investigation. W. L. C.

The Buffalo Machinists' Strike

From an interview with William H. Barr, president, and John E. Gorss, secretary, of the Employers' Association of Buffalo, it is learned that this week only about 400 men, all told, of the plants affected by the machinists' strike are still out. These are employees of the shops of the Buffalo Gasoline Motor Company, Sterling Engine Company, Olin Gas Engine Company, Contractors' Plant Mfg. Company and D. H. Stoll Company. Some of the men of the Sterling Engine Company have returned to work. Secretary Gorss expects these shops to be completely supplied before the end of this week. The men who were employed at the shops in question have already called upon their employers (not as representatives of the union but as committees of the employees) and have had conferences on the subject of returning to their old positions.

At plants where operations have been resumed it has been under arrangement between employer and employees arrived at by agreement entirely with the employees as individuals and not as members of the union, neither the international organizer of the Machinists' Union or other officers or representatives of the union being present at any of the conferences. None of the agreements upon which the men were taken back was based on the 50-cent weekly scale or a minimum wage or recognition of the union. Practically speaking, the men returned to work on the conditions obtaining prior to the strike, leaving the question of any advances in wages to be adjusted as between employer and employee.

Up to the present time the employers at the plants still affected have made no effort to secure new men from out of town to replace employees who have not yet returned to work, preferring to wait for them to come back, but if they do not return soon steps will be taken to replace them.

At the plant of the Niagara Machine & Tool Works, which company absolutely refused in any way to treat with the union, the men took a vote on Saturday relative to returning to work, resulting in 91 machinists voting to return on Monday morning and 15 to stay out. On Monday morning 103 men returned. None of the force at the Pierce-Arrow Motor Car Company's plant went out, the men stating that they were entirely satisfied with the wages, hours, and treatment accorded them.

Management of Small Versus Large Plants*

A Brief for the Foreman of Large Authority Over a Few Men—Splitting a Factory into Independent Units

BY STUART DEAN

In a little shop of four men the proprietor generally works at the product with his own hands. Every person in the shop is a producer. If the proprietor be a good manager, he can do work at quite a low price and continue in business. He knows what his product costs, because he has figured costs in his head as he goes along. Suppose he earns \$2 a day more than the regular wage rate for mechanics in his locality. These \$2 include some money that he puts back into the business to enlarge it. If his business should double, the shop would require eight men including the proprietor. He then would probably make \$4 a day over the regular wage rates for mechanics. The money that he puts into the business to increase it corresponds to the stocks and bonds of a large corporation. If the shop growth continues until the concern employs 2000 men, and the rate of profit remains \$1 a day from every two men, a corporation employing 2000 men should make a profit of \$1,000 a day, or \$300,000 a year, after interest is all paid on bonds on preferred stock, and say 5 per cent. on common stock.

Large corporations never make such profits; in fact, many pay no interest on their common stock. Others are not able to pay the full contract rate on their preferred stock, and some even have trouble getting enough profit from the business to pay the bond interest.

Why Small Concern Has Best Profit Possibilities

Why is it that the small concern, well managed, can make a greater per cent. profit than the great corporations? It is simply because the proportion of money that goes to the non-producers is many times greater in the large concern than the small.

The only way to manufacture successfully on a very large scale is to split the business into separate classes of output. Manufacture each class of goods from start to finish in a small factory, having its own manager and foreman, and its own separate bookkeeping. Everything that the factory receives is charged up to it, and everything that the factory ships is credited to it. Success or failure of any one of these small manufacturing units is due to the style of direction given it by its manager. Every manager knows this. He must be successful or be dismissed. Failure, using this system, is impossible. Many of these small factories may be under one roof, or in one room, in fact, but they must be kept absolutely separate from one another.

As a foreman cannot successfully oversee more than 20 men, the departments, or factories, will be small. A foreman who has 20 men under him can give 15 min. of his time to each man in the morning, and 15 min. in the afternoon. To have the work closely directed, and the men turn out a large output accurately made requires this amount of directing. Where a foreman has 40 men under him, he is so buried in miscellaneous work that weeks go by without his being able to give more than a passing glance at some of the standard stock jobs, yet this stock work, in order to be done profitably, requires close attention; it yields the smallest margin of profit, generally. It should be the most closely watched of all the work.

These separate factories may run 20 to 30 men in the machine department, with a foreman over them, and 10 to 15 men in the assembling department, with a foreman and require about two clerks in the office department and a manager over the whole unit. In these small factories each foreman will have complete ironclad authority, as head of his department. This will bring out all there is in him. There are no sub-foremen in this scheme; sub-foremen are never allowed complete authority.

A very successful steel casting firm was asked, "Do

you mix something special in your steel castings that makes them always come out so perfect?" The gruff old president answered, "Yes, we mix in brains." This system mixes successful managing brains at the very point where the work is being turned out, a good manager for every 20 men. This system does away with an army of high-priced "white shirt men," as the workmen call the higher managers.

The Overhead Expenses of Large Scale Manufacturing

Compare the overhead expense of such a unit with the overhead expense of some of our giant plants managed in the old way. I am told that a large engine plant employing 3000 men had 800 people in the office. This is more than one in the office to four in the shop.

Very large plants are usually managed by a head who has lesser heads under him, and they in turn lesser, etc., something like an inverted family tree. Interspersed through the limbs of this inverted tree is an army of assistants, stenographers, inspectors, detectives, errand boys and other pencil pushers. All are necessary to the system, sapping the strength from the great, bulky, limping concern. Their salaries are charged to overhead expense.

The above-mentioned system of management demands an army of men of unusual executive ability. Such men, being rare, command high salaries, which occasion the heavy overhead expenses of large corporations. The speed at which the work is turned out in these large concerns is left to the workmen or to the gang bosses. The gang bosses are very much handicapped by being allowed small authority. Most of the time of the managers, overseers and assistants is taken up in holding the organization together.

Interstate Commerce Commission Proceedings

WASHINGTON, D. C., June 3.—The Interstate Commerce Commission has suspended from June 1 until September 29, pending investigation, proposed increases in freight rates on scrap iron and old rails between St. Paul and Duluth, Minn., and Chicago, Ill., St. Louis, Mo., and points taking same rates. The proposed increase in the scrap iron rates amounts to from ½c. to 2c. per 100 lb., and that in the old rail rates from 1.7c. to 5.6c. per 100 lb. The present rates on scrap iron and old rails from Chicago to St. Paul, for example, are 8c. and 7.8c. per 100 lb., respectively; the advanced rate proposed is 10c. per 100 lb. on both commodities, and the increase 2c. and 2.2c. respectively.

The American Metal Company, Ltd., Newark, N. J., has filed with the commission a complaint against the Central Railroad Company of New Jersey and the New York, New Haven & Hartford Railroad Company, alleging that the freight rate on copper bars from Newark to Worcester, Mass., Darlington, R. I., and Ansonia, Conn., is excessive. It is stated that the rate to Worcester and Darlington is 17c. per 100 lb., and to Ansonia, 14c. per 100 lb., and that the rate from Carteret, Chrome, Perth Amboy, and Bay Way, N. J., to the same destinations in New England is 10c. per 100 lb., and that this constitutes a discrimination against Newark.

W. L. C.

For painting standpipe interiors, the Metropolitan Waterworks of Boston, Mass., has found red lead paint a good protection against rusting. Dexter Brackett, chief engineer of the waterworks, in discussing the subject at a late meeting of the New England Waterworks Association, mentioned that the paint used is mixed in the proportion of 3 gal. of boiled linseed oil to 100 lb. of red lead to which is added 2½ lb. of litharge thoroughly beaten up with the linseed oil. The litharge is employed to cause quick drying and hardening of the paint. The formula is one used by the United States Navy for paint for the bottoms of ships.

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Pig Iron Output Less

A Net Loss of 13 Furnaces in May

Active Capacity June 1 Is 2600 Tons a Day
Less than on May 1

Pig iron production is falling off and the indications are that the curtailment movement will go further in June. The output of coke and anthracite iron in May was 2,822,217 gross tons, or 91,039 tons a day, against 2,752,761 tons in the 30 days of April, or 91,759 tons a day. Furnaces are blowing out in view of increasing stocks and a continuous fall of prices in the past five months, with no general buying movement yet in evidence. On June 1 the active furnaces numbered 285 with a daily capacity of 90,220 tons, against 298 furnaces, with daily capacity of 92,819 tons in May.

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, from May, 1912, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons.			
	Steel works.	Merchant.	Total.
May, 1912	62,018	19,033	81,051
June	60,799	20,559	81,358
July	58,168	19,570	77,738
August	59,464	21,582	81,046
September	59,102	23,026	82,128
October	62,820	23,952	86,772
November	62,817	24,878	87,695
December	63,770	25,996	89,766
January, 1913	63,921	26,251	90,172
February	64,005	28,364	92,369
March	61,448	27,699	89,147
April	64,658	27,101	91,759
May	64,232	26,807	91,039

Output by Districts

The accompanying table gives the production of all coke and anthracite furnaces in May and the four months preceding.

Monthly Pig-Iron Production—Gross Tons.					
	Jan. (31 days)	Feb. (28 days)	Mar. (31 days)	Apr. (30 days)	May (31 days)
New York	188,943	180,789	188,335	189,818	193,112
New Jersey	5,833	5,644	11,100	10,154	10,906
Lehigh Valley	99,470	93,552	103,428	100,141	97,591
Schuylkill Valley	80,223	65,362	78,157	78,225	78,745
Lower Susquehanna and Lebanon Val.	72,172	69,205	76,612	68,682	64,548
Pittsburgh district	626,118	569,457	639,832	648,223	613,258
Shenango Valley	152,065	145,464	132,536	136,685	144,746
Western Pennsylv'a	163,563	147,279	166,825	167,251	167,197
Maryland, Virginia and Kentucky	61,026	61,704	65,808	57,885	60,502
Wheeling district	111,595	114,979	103,003	119,251	128,618
Mahoning Valley	259,756	255,425	235,542	248,425	273,666
Central and North- ern Ohio	246,709	208,822	218,169	209,531	252,542
Hocking Valley, Hanging Rock and S. W. Ohio	29,247	35,981	40,354	31,490	41,291
Chicago district	402,408	357,700	392,297	388,061	405,605
Mich., Minn., Mo., Wis., Col., Wash.	83,750	79,875	88,671	83,773	78,493
Alabama	180,790	164,642	186,940	181,256	179,948
Tennessee	31,863	30,457	35,954	33,910	31,449
Total	2,795,331	2,586,337	2,763,563	2,752,761	2,822,217

Production of Steel Companies

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in these figures, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons.					
	Fig. Total production—			Spiegeleisen and ferromanganese	
	1911.	1912.	1913.	1911.	1912.
January	1,128,448	1,483,153	1,981,560	8,360	22,622
February	1,185,782	1,550,995	1,792,154	12,821	15,950
March	1,518,063	1,827,792	1,904,878	11,784	11,538
April	1,434,142	1,830,717	1,939,751	10,657	11,104
May	1,310,378	1,922,557	1,991,192	13,641	20,518
June	1,281,241	1,823,958	.....	22,611	26,685
July	1,316,646	1,803,205	.....	17,067	26,522
August	1,460,610	1,843,404	.....	14,579	24,225
September	1,490,898	1,773,073	.....	17,757	22,484
October	1,560,884	1,947,426	.....	19,697	27,252
November	1,452,907	1,884,524	.....	19,678	17,461
December	1,453,446	1,976,870	.....	20,068	18,523

Capacity in Blast June 1 and May 1

The following table shows the daily capacity, in gross tons, of furnaces in blast June 1 and May 1 by districts:

Coke and Anthracite Furnaces in Blast.					
Location of Furnaces.	Total number of stacks.	June 1		May 1	
		Number in blast.	Capacity per day.	Number in blast.	Capacity per day.
New York:					
Buffalo	19	16	5,548	17	5,650
Other New York	7	3	590	1	611
New Jersey	7	2	352	2	318
Pennsylvania:					
Lehigh Valley	22	12	2,935	14	3,082
Spiegel	2	2	164	2	173
Schuylkill Valley	16	10	2,545	10	2,608
Lower Susquehanna	7	5	1,032	6	1,213
Lebanon Valley	10	6	860	7	1,057
Pittsburgh District	51	46	20,150	45	20,215
Spiegel	3	2	425	3	566
Shenango Valley	19	15	4,670	15	4,554
Western Pennsylvania	27	18	5,393	19	5,577
Maryland	4	3	818	3	834
Wheeling District	14	11	4,150	11	4,035
Ohio:					
Mahoning Valley	24	22	8,828	22	8,811
Central and Northern Hocking Val., Hanging Rock, & S. W. Ohio	24	22	7,946	22	7,634
Illinois and Indiana	15	9	1,150	10	1,290
Spiegel	34	31	12,425	33	13,315
Mich., Wis. and Minn.	2	0	0	0	0
Colo., Mo. and Wash.	10	7	1,390	8	1,630
The South:	8	3	1,050	3	1,062
Virginia	23	8	1,026	8	1,114
Kentucky	5	1	148	1	130
Alabama	46	23	5,673	23	6,172
Tennessee	20	8	952	9	1,075
Total	419	285	90,220	298	92,819

Among furnaces blown out in May were one Wickwire at Buffalo, Macungie and one Hokendauqua in the Lehigh Valley, Lochiel in the Susquehanna Valley, one Lebanon in the Lebanon Valley, one Edgar Thomson and one Eliza in Allegheny county, Perry in western Pennsylvania, Marting in the Hanging Rock region, one South Chicago and one Gary in the Chicago district, one Pioneer and one Sloss-Sheffield in Alabama, and one Mayville in Wisconsin. There was little blowing in of furnaces last month. In this list there were only one Shoenberger and one Carrie in Allegheny county.

Diagram of Pig-Iron Production and Prices

The fluctuations in pig-iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The figures for daily average production are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons.										
	1907.	1908.	1909.	1910.	1911.	1912.	1913.			
January	71,149	33,918	57,975	84,148	56,752	66,384	90,172			
February	73,038	37,163	60,976	85,616	64,090	72,442	92,369			
March	71,821	39,619	59,232	84,459	70,036	77,591	89,147			
April	73,885	38,289	57,962	82,792	68,836	79,181	91,759			
May	74,048	37,603	60,753	77,102	61,079	81,051	91,039			
June	74,486	36,444	64,656	75,516	59,585	81,358	.....		
July	72,763	39,287	67,793	69,305	57,841	77,738	.....		
August	72,594	42,851	72,546	67,963	62,150	81,046	.....		
September	72,783	47,300	79,507	68,476	65,903	82,128	.....		
October	75,386	50,554	83,856	67,520	67,811	86,772	.....		
November	60,937	51,595	84,917	63,659	66,648	87,695	.....		
December	39,815	56,158	85,022	57,349	65,912	89,766	.....		

The Record of Production

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1908—Gross Tons.						
	1908.	1909.	1910.	1911.	1912.	1913.
Jan.	1,045,250	1,797,560	2,608,605	1,759,326	2,057,911	2,795,331
Feb.	1,077,740	1,707,340	2,397,254	1,794,509	2,100,815	2,586,337
Mar.	1,228,204	1,832,194	2,617,949	2,171,111	2,405,318	2,763,563
Apr.	1,149,602	1,738,877	2,483,763	2,064,086	2,375,436	2,752,761
May	1,165,688	1,883,330	2,390,180	1,893,456	2,512,582	2,822,217
June	1,092,131	1,930,866	2,265,478	1,787,566	2,440,745	.....
July	1,218,129	2,103,431	2,148,442	1,793,068	2,410,889	.....
Aug.	1,359,831	2,248,930	2,106,847	1,926,637	2,512,431	.....
Sept.	1,418,998	2,385,206	2,056,275	1,977,102	2,463,839	.....
Oct.	1,567,198	2,599,541	2,093,121	2,102,147	2,689,933	.....
Nov.	1,577,854	2,547,508	1,909,780	1,999,433	2,630,854	.....
Dec.	1,740,912	2,635,680	1,777,817	2,043,270	2,782,737	.....

The plant of the New Castle Stamping Company was sold May 31 by George W. Johnston, receiver, to Edward King, president of the Bank of Lawrence County and president and treasurer of the Pennsylvania Engineering Works, New Castle, Pa., for \$350, subject to a bond issue of originally \$150,000, which has accumulated interest until the amount is nearly \$200,000. Negotiations are in progress with several parties for the disposal of this plant, which has been idle for a long time.

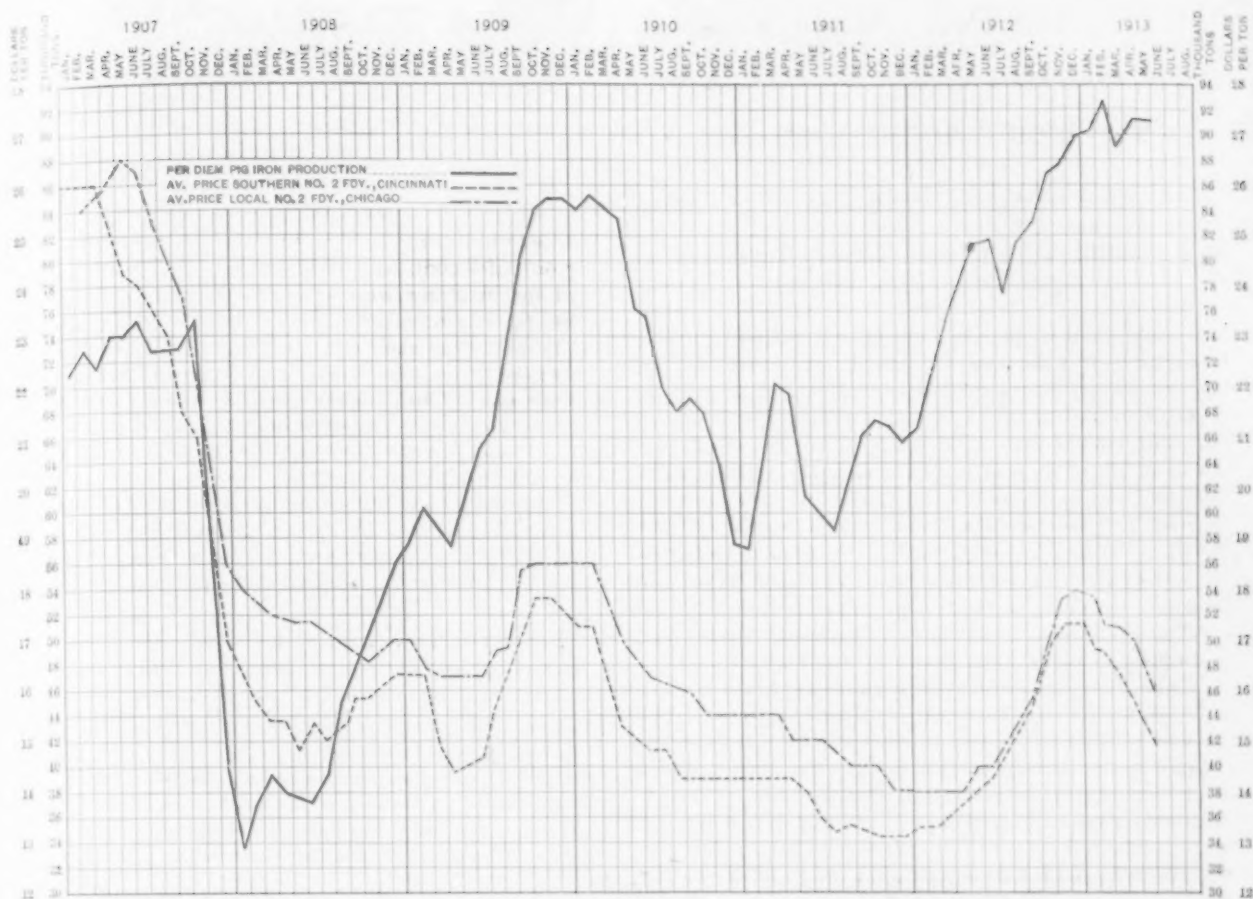


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to June 1, 1913; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

Pittsburgh and Vicinity Business Notes

The Zug Iron & Steel Company, operating the Sable Iron Works, has opened downtown offices in rooms 703-04-05 Park Building, Pittsburgh. This is one of the oldest manufacturing concerns in the Pittsburgh district. It is at present confining its product to high-grade iron bars for forging irons and for making chain, stay bolts and engine bolts. The company's sheet mill has been closed for several years. William M. Wherry, Jr., is president; George W. English, formerly with the blast furnace of the Perry Iron Company at Erie, Pa., treasurer and general manager; A. M. Brown, secretary, and F. C. Campbell, assistant secretary.

Gammestad & Jacobson have opened offices as consulting engineers in room 1211 Machesney Building, Pittsburgh.

The Dawson Pump Company has made an arrangement to lease the plant of the Altoona Foundry & Machine Company at Altoona, Pa., for two years from September 1, 1913, at a nominal rental, with the privilege of purchasing for the sum of \$25,000. The Dawson Company will manufacture self-priming rotary pumps and other specialties on which it holds patents.

Last week there was launched at Pittsburgh for the Vesta Coal Company, an identified interest of the Jones & Laughlin Steel Company, a 200-ft. steel barge. The Jones & Laughlin Company has been building two barges a month for the Vesta Company for some time, and expects to continue until it has a fleet of about 100. They are twice as long as the standard coal barge used on the rivers in the Pittsburgh district, but have been found as easy to handle. Each barge requires about 200 tons of plates and shapes.

The Jones & Laughlin Steel Company has been experimenting for months with methods for reducing the emission of ore dust from its blast furnace stacks occasioned by "slips" in the furnaces. Stacks which have been relined or closed down for other repairs have been rebuilt to withstand a pressure of 150 lb. per sq. in., and appliances installed to carry excessive gases into the stoves and combustion furnaces and the ore dust into receivers.

The Pittsburgh office of the Erie City Iron Works has furnished to the Standard Tin Plate Company, Canonsburg, Pa., a 150-kw. four-valve engine generator set and to the H. C. Frick Coke Company the eighteenth order for a 200-kw. four-valve engine generator set.

On Tuesday evening, June 3, Kenneth Seaver, chief engineer of the Harbison-Walker Refractories Company, Pittsburgh, read a paper before the mechanical section of the Engineers' Society of Western Pennsylvania on "Refractory Materials in Modern Boiler Plants." On Tuesday evening, June 17, W. H. Potter of the Alloy Steel Forging Company, Oliver Building, Pittsburgh, will read a paper before the society on "Manganese Steel."

The Pittsburgh office of the Babcock & Wilcox Company has sold two 127-hp. boilers to be installed in the Pittsburgh station of the Baltimore & Ohio Railroad. They will be fired with chain grate stokers. The same company has taken a contract for 1000-hp. boilers to be installed in the Brilliant pumping station, Pittsburgh, for the Department of Public Works. These boilers will be fired with Murphy stokers.

A number of puddlers employed by the Girard Iron Company at Girard, Ohio, went on strike last week claiming they were being furnished with an inferior grade of coal which prevented them from making a full output of puddled iron.

The Pittsburgh office of the Erie City Iron Works Erie, Pa., T. H. McGraw, Jr., manager, has sold to the Standard Tin Plate Company, Canonsburg, Pa., an 18 x 21 in. four-valve engine to be direct connected to a 200-kw. generator, and to the H. C. Frick Coke Company an 18 x 21 in. four-valve engine to be direct connected to a 200-kw. generator at the Mammoth mines, Westmoreland County, Pa.

The Alabama Company.—The reorganization of the Alabama Consolidated Coal & Iron Company, Birmingham, Ala., has been completed, the properties being taken over by the Alabama company, under which name they will be operated. H. W. Meserve, of the Baltimore banking house of Middendorf, Williams & Co., has been elected president of the Alabama company.

The Iron and Metal Markets

Pig Iron Output Curtailed

But with No Effect as Yet on Prices

May Falling Off in *Steel Orders Less than in April—Iron Pipe Higher

Curtailment of pig-iron output has begun. In May production of coke and anthracite iron was 2,822,217 tons, or 91,039 tons a day, against 2,752,761 tons in the 30 days of April, or 91,759 tons a day. June opened with 285 furnaces in blast, or 13 less than on May 1, and their capacity was 90,220 tons a day against 92,819 tons on May 1, a reduction of 2600 tons a day.

The pig-iron situation has grown steadily worse. Stocks increased in May, even with some reduction in output, and it is expected further additions to the idle list will be made this month. Certain Eastern and Southern furnaces would drop to their cost line if they attempted to meet some prices recently quoted.

Taking inquiries and sales together, the Eastern pig-iron market has shown more life than that of any other district. Sales of 25,000 to 30,000 tons are reported, including pipe iron, and prices were the lowest of the year. In central and western districts the decline of Southern iron to \$11, Birmingham, for No. 2 has not been signalized by any important buying by the consumers who had announced that they were waiting for that figure. The immediate course of the market depends somewhat on the vigor of the blowing-out movement.

Basic iron has sold in a small way at \$14.50 at Valley furnace, but no large steel works requirements have been developed. In the Lebanon Valley, low phosphorus iron has sold at \$19 at furnace.

The discouraging conditions in pig iron have not yet had more than a sentimental effect on the steel trade, though naturally rumors of weakness in prices of certain finished materials come up more frequently. Semi-finished steel yields slowly to the gradual reduction in orders on the books. A sale of 15,000 tons of sheet bars for the second half was made at \$27.50, Youngstown, and in the East a quotation of \$27 at mill on open-hearth billets has been made on Western business.

May was a better month for finished material orders than April, and the Steel Corporation's statement is expected to show about 200,000 tons falling off, as against 490,000 tons in April. The corporation is now operating 92 per cent of its pig-iron capacity and 99 per cent of its steel-ingot capacity.

The present policy of buyers is not due so much to the expectation of early reductions in prices as to the belief that the necessity of specifying far forward is passing. In a few cases there have been cancellations of bar orders booked for the third quarter. Further weakness in bar iron has appeared in the Central West, as low as 1.45c. having been done at Chicago district mill.

An advance of \$2 a ton has been made in steel boiler tubes of from 3 to 4½ in. The manufacturers of iron pipe, following two advances of one-half point each in steel pipe since early April, have this week advanced their products, both black and galvanized, one point, or \$2 a ton.

One rail inquiry for 1914 delivery is reported, but it is not typical. The Cordova Central Railway in Argentina has ordered 10,000 tons of rails from the United States Steel Products Company.

Structural orders are of better volume than some

recent prices have suggested. Railroad work has been a larger part of the total than in a number of years, 40 per cent. in the case of one large company for several months. The North Coast Railroad has let 2500 tons for a Spokane bridge and the Norfolk & Western has placed 3000 tons. At Detroit the Washington hotel contract, 3000 tons, was let, and at Cleveland specifications were put out for the May Company store, 6000 to 8000 tons.

Demand for cast-iron pipe has sprung up in many directions. Inquiries from Cuba and Porto Rico amount to 9500 tons. The 100,000-ton Buenos Ayres water-line project is up again, but it is not decided whether rolled or cast-iron pipe will be used.

Lake Superior iron-ore shipments in May reached the surprising total of 7,284,212 gross tons, the first time the 7,000,000-ton mark had ever been passed in that month. May shipments last year were 5,919,074 tons.

Reports from British and German iron and steel markets are not favorable. Prices of nearly all products are lower and buyers are holding off, though consumption has declined but little. World sentiment in iron and steel is much less hopeful than at the opening of the year. So far as the United States is concerned the mainstays of those who look for better things in the fall are large crops and the expectation that railroad rates will be advanced.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type,
Declines in Italics

At date, one week, one month, and one year previous.

June 4, May 28, May 7, June 5,

Pig Iron, Per Gross Ton:	1913.	1913.	1913.	1912.
Foundry No. 2 X, Philadelphia.	\$16.50	\$16.50	\$17.00	\$15.25
Foundry No. 2, Valley furnace.	14.25	14.50	15.00	13.25
Foundry No. 2 S'th'n, Cin'ti...	14.25	14.75	15.25	14.25
Foundry No. 2, Birmingham, Ala.	17.00	11.50	12.00	11.00
Foundry No. 2, furnace, Chicago*	16.00	16.00	16.00	14.50
Basic, delivered, eastern Pa....	16.50	16.50	16.50	15.25
Basic, Valley furnace.....	14.50	14.75	15.50	13.00
Bessemer, Pittsburgh.....	17.50	17.50	17.90	15.15
Malleable Bessemer, Chicago*...	16.00	16.00	16.00	14.50
Gray forge, Pittsburgh.....	14.90	14.90	15.40	13.90
Lake Superior charcoal, Chicago	17.50	18.00	18.00	16.25

Billets, etc. Per Gross Ton:	26.50	26.50	28.00	21.00
Bessemer billets, Pittsburgh....	26.50	26.50	28.50	20.50
Open hearth billets, Pittsburgh..	34.00	34.00	36.00	28.00
Open-hearth billets, Philadelphia	28.00	28.00	29.00	23.40
Wire rods, Pittsburgh.....	30.00	30.00	30.00	25.00

Old Material, Per Gross Ton:	15.75	15.75	16.00	16.00
Iron rails, Chicago.....	18.00	18.00	18.00	16.50
Iron rails, Philadelphia.....	14.25	14.25	15.25	14.25
Carwheels, Chicago.....	13.50	13.50	14.00	13.50
Carwheels, Philadelphia.....	13.00	13.00	13.75	13.25
Heavy steel scrap, Pittsburgh....	10.50	10.50	11.75	12.00
Heavy steel scrap, Chicago.....	12.00	11.50	12.50	13.50

Finished Iron and Steel,	Cents.	Cents.	Cents.	Cents.
Per Pound to Large Buyers:	1.25	1.25	1.25	1.25
Bessemer rails, heavy, at mill...	1.57½	1.57½	1.57½	1.30
Iron bars, Philadelphia.....	1.70	1.70	1.70	1.25
Iron bars, Chicago.....	1.50	1.57½	1.57½	1.25
Steel bars, Pittsburgh, future..	1.40	1.40	1.40	1.20
Steel bars, Pittsburgh, prompt..	1.70	1.70	1.70	1.20
Steel bars, New York, future...	1.56	1.56	1.56	1.36
Steel bars, New York, prompt..	1.86	1.86	1.86	1.36
Tank plates, Pittsburgh, future..	1.45	1.45	1.45	1.25
Tank plates, Pittsburgh, prompt	1.60	1.60	1.60	1.41
Tank plates, New York, future	1.61	1.61	1.61	1.41
Tank plates, New York, prompt	1.76	1.76	1.76	1.41
Beams, Pittsburgh, future.....	1.45	1.45	1.45	1.25
Beams, Pittsburgh, prompt.....	1.50	1.50	1.50	1.25
Beams, New York, future.....	1.61	1.61	1.61	1.41
Beams, New York, prompt.....	1.66	1.66	1.66	1.41
Angles, Pittsburgh, future.....	1.45	1.45	1.45	1.25
Angles, Pittsburgh, prompt.....	1.50	1.50	1.50	1.25
Angles, New York, future.....	1.61	1.61	1.61	1.41
Angles, New York, prompt.....	1.66	1.66	1.66	1.41
Skelp, grooved steel, Pittsburgh.	1.45	1.45	1.45	1.15
Skelp, sheared steel, Pittsburgh.	1.50	1.50	1.50	1.20
Steel hoops, Pittsburgh.....	1.60	1.60	1.60	1.25

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire, Per Pound to Large Buyers:	June 4, 1913.	May 28, 1913.	May 7, 1913.	June 5, 1912.
	Cents.	Cents.	Cents.	Cents.
Sheet, black, No. 28, Pittsburgh	2.30	2.30	2.30	1.90
Wire nails, Pittsburgh	1.80	1.80	1.80	1.60
Cut nails, L. & B. Eastern mills	1.80	1.80	1.80	1.60
Cut nails, Pittsburgh	1.70	1.70	1.70	1.55
Fence wire, ann'd, 0 to 9, Pgh.	1.60	1.60	1.60	1.40
Barb wire, galv., Pittsburgh	2.20	2.20	2.20	1.90

Coke, Connellsville, Per Net Ton, at Oven:				
Furnace coke, prompt shipment	\$2.15	\$2.15	\$2.15	\$2.10
Furnace coke, future delivery	2.25	2.25	2.25	2.35
Foundry coke, prompt shipment	2.85	2.85	3.00	2.40
Foundry coke, future delivery	3.00	3.00	2.90	2.50

Metals, Per Pound to Large Buyers:				
	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	15.75	15.75	16.00	17.25
Electrolytic copper, New York	15.25	15.65	15.62½	17.12½
Spelter, St. Louis	5.15	5.25	5.40	6.75
Spelter, New York	5.30	5.40	5.55	6.90
Lead, St. Louis	4.20	4.20	4.20	4.12½
Lead, New York	4.35	4.35	4.35	4.20
Tin, New York	46.60	48.75	50.12½	45.75
Antimony, Hallett, New York	8.20	8.20	8.12½	7.85
Tin plate, 100-lb. box, Pittsburgh	\$3.60	\$3.60	\$3.60	\$3.40

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets, Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.45c. to 1.50c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft., down to the weight of 3-16 in., take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.	Cents per lb.
Gauges under ¼ in. to and including 3-16 in.	.10
Gauges under 3-16 in. to and including No. 2	.15
Gauges under No. 8 to and including No. 9	.25
Gauges under No. 9 to and including No. 10	.30
Gauges under No. 10 to and including No. 12	.40
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in.	1.00
Cutting to lengths, under 3 ft., to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft., to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55
No charge for cutting rectangular plates to lengths 3 ft. and over.	

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and tees, 3 in. and over, 1.45c. to 1.50c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in. on one or both legs	.10
Angles, 3 in. on one or both legs, less than ¼ in. thick, as per steel bar card, Sept. 1, 1909	.70
Tees, structural sizes (except elevator, hand rail, car-truck and conductor rail)	.05
Angles, channels and tees, under 3 in. wide as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Hand rail tees	.75
Cutting to lengths, under 3 ft., to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft., to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55
No charge for cutting to lengths 3 ft. and over.	

Wire Rods and Wire.—Bessemer, open-hearth and chain rods, \$30. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, \$1.60; galvanized, \$2. Galvanized barb wire, to jobbers, \$2.20; painted, \$1.80. Wire nails, to jobbers, \$1.80.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.									
Nos.	0 to 9	10	11	12 & 12½	13	14	15	16	
Annealed	\$1.75	\$1.80	\$1.85	\$1.90	\$2.00	\$2.10	\$2.20	\$2.30	
Galvanized	2.15	2.20	2.25	2.30	2.40	2.50	2.90	3.00	

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe (full weight) in effect from May 27, 1913, iron pipe (full weight), from June 2, 1913:

Steel.			Butt Weld.		Iron.		
Inches.	Black.	Galv.	Inches.		Black.	Galv.	
¾, ¾ and ¾	72	51½	¾ and ¾		66	47	
½	76	65½	¾		65	46	
¾ to 3	79	70½	¾		69	56	
			¾ to 2½		72	61	
Lap Weld							
2	76	67½	1½		56	45	
2½ to 6	78	69½	1½		67	56	
7 to 12	75	64½	2		68	58	
13 to 15	52		2½ to 4		70	61	
			4½ to 6		70	61	
			7 to 12		68	55	

Reamed and Drifted.					
1 to 3, butt.....	77	68½	1 to 1½, butt.....	70	59
2, lap.....	74	65½	2, butt.....	71	60
2½ to 4, lap.....	76	67½	1½, lap.....	54	43
			1½, lap.....	65	54
			2, lap.....	66	56
			2½ to 4, lap.....	68	59

Butt Weld, extra strong, plain ends.					
¾, ¾ and ¾.....	67	56½	¾	63	52
½	72	65½	½	67	60
¾ to 1½	76	69½	¾ to 1½	71	62
2 to 3	77	70½	2 and 2½	72	63

Lap Weld, extra strong, plain ends.					
2	73	64½	1½	65	59
2½ to 4	75	66½	2	66	58
4½ to 6	74	65½	2½ to 4	70	61
7 to 8	67	56½	4½ to 6	69	60
9 to 12	62	51½	7 and 8	63	53
			9 to 12	58	47

Butt Weld, double extra strong, plain ends.					
¾	62	55½	¾	57	49
¾ to 1½	65	58½	¾ to 1½	60	52
2 to 2½	67	60½	2 and 2½	62	54

Lap Weld, double extra strong, plain ends.					
2	63	56½	2	55	49
2½ to 4	65	58½	2½ to 4	60	54
4½ to 6	64	57½	4½ to 6	59	53
7 to 8	57	46½	7 to 8	52	42

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads on lap-welded steel, in effect from May 29, 1913, and standard charcoal-iron boiler tubes, in effect from January 1, 1913, are as follows:

Lap-Welded Steel.		Standard Charcoal Iron.	
1¼ and 2 in.	60	1½ in.	44
2¼ in.	57	1¼ and 2 in.	48
2½ and 2¾ in.	63	2½ in.	44
3 and 3¼ in.	67	2½ and 2¾ in.	53
3½ to 4½ in.	69	3 and 3¼ in.	55
5 and 6 in.	63	3½ to 4½ in.	58
7 to 13 in.	60	Locomotive and steamship special grades bring higher prices.	

2½ in. and smaller, over 18 ft., 10 per cent. net extra.

2¼ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Sheets.—Makers' prices for mill shipments on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets.		Cents per lb.
Nos. 3 to 8		1.70
Nos. 9 and 10		1.75
Nos. 11 and 12		1.80
Nos. 13 and 14		1.85
Nos. 15 and 16		1.95

Box Annealed Sheets, Cold Rolled.		
Nos. 10 and 11		1.95 to 2.00
No. 12		1.95 to 2.00
Nos. 13 and 14		2.00 to 2.05
Nos. 15 and 16		2.05 to 2.10
Nos. 17 to 21		2.10 to 2.15
Nos. 22 and 24		2.15 to 2.20
Nos. 25 and 26		2.20 to 2.25
No. 27		2.25 to 2.30
No. 28		2.30 to 2.35
No. 29		2.35 to 2.40
No. 30		2.45 to 2.50

Galvanized Sheets of Black Sheet Gauge.

	Cents per lb.
Nos. 10 and 11.....	2.40 to 2.50
No. 12.....	2.50 to 2.60
Nos. 13 and 14.....	2.50 to 2.60
Nos. 15 and 16.....	2.65 to 2.75
Nos. 17 to 21.....	2.80 to 2.90
Nos. 22 and 24.....	2.95 to 3.05
Nos. 25 and 26.....	3.10 to 3.20
No. 27.....	3.25 to 3.35
No. 28.....	3.40 to 3.50
No. 29.....	3.55 to 3.65
No. 30.....	3.70 to 3.80

Pittsburgh

PITTSBURGH, Pa., June 3, 1913.

Reports of a slowing down in steel production seem to be wide of the fact. Three of the leading producers of Bessemer and open-hearth steel state that in May their output of ingots and finished steel was the largest in any one month in their history, and two of them report record breaking shipments for any one month in both semi-finished steel and in finished products. In fact the production of finished steel in May very likely broke previous records. All plants in the Pittsburgh and Valley districts continue to be operated to their highest rate. The leading steel companies report specifications of 75 to 80 per cent. against shipments. The fact that May shipments were greater than those of April is because they were made on specifications received two or three months ago or longer. Prices are fairly strong in finished material, but wire products are somewhat weak, and scrap is still receding. The leading interest has announced an advance of \$2 a ton in steel boiler tubes from 3 to 4½ in. and quite a heavy advance in water-casing pipe followed by the other mills. Wrought-iron pipe has been advanced one point, \$2 per ton. The coke market, in the face of declining prices on pig iron, is holding up well. The fact that practically no declines have taken place in prices of finished material, when the declines in pig iron are considered, is regarded as remarkable, and reflects strongly the filled-up condition of the mills before the decline started. How soon easier prices may reach semi-finished steel and finished products is a question. The mills are, of course, working up to less actual business on their books, but with actual orders running over the next two or three months and contracts for four or five months it is strongly argued that no serious decline in prices can take place within the next 60 days at least. It is claimed that a great deal of new business is being held up on account of pending tariff legislation.

Pig Iron.—W. P. Snyder & Co. announce that the average price of Bessemer iron in May was \$16 and basic \$14.899 as compared with \$17.008 on Bessemer and \$15.714 on basic in April, these prices being based on sales of 1000 tons and over. The much discussed contract of the Westinghouse Electric & Mfg. Company for its last half iron has not yet been placed. The Colonial Steel Company of this city has inquiries out for 1500 tons of basic for June and 1000 to 1500 tons a month for July, August and September. The recent inquiry of the Pittsburgh Steel Foundry Company for 500 tons of basic for June delivery has not been closed. Other inquiry for basic is expected within a short time and predictions are made that \$14.50 Valley furnace will be shaded, as several small lots, one of 200 tons, have been sold at that price. The Union Radiator Company, Johnstown, Pa., is figuring on 1000 tons of foundry iron for third quarter. There is no new inquiry for Bessemer iron. Small foundries are buying foundry iron for June and July delivery, not being disposed to cover their wants far ahead. We quote Bessemer iron at \$16.60; basic, \$14.50; malleable Bessemer, \$14.50 to \$14.75; No. 2 foundry, \$14.25 to \$14.50; gray forge, \$14. all at Valley furnace, the freight rate to the Pittsburgh district being 90c. a ton.

Billets and Sheet Bars.—In May the Republic Iron & Steel Company broke all records for output of Bessemer and open-hearth steel ingots in any one month in its history and yet it is short of steel in some of its finishing mills and has only operated its plate mill single turn for some months owing to that condition. A leading tin plate company in the Pittsburgh district has contracted with a Youngstown interest for 15,000 tons of tin bars for delivery over last half on the basis of \$27.50 at maker's mill. The same consumer bought some time ago 25,000 tons of tin bars from another Youngstown mill, but as it uses 8500 tons a month it is still short about 10,000 tons and this will likely go to a Pittsburgh mill. Not much new inquiry is out for billets and sheet bars, nearly all consumers being covered by contracts and having regular sources of supply. While deliveries of steel to the finishing mills are bet-

ter than for some time, there is still a shortage, the leading tin plate and sheet interest not yet being able to get steel fast enough to operate its mills to capacity. We continue to quote Bessemer and open-hearth billets for June shipment, and also for third quarter delivery, at \$26.50 to \$27 and Bessemer and open-hearth sheet bars for same deliveries at \$27 to \$27.50, maker's mill, Youngstown or Pittsburgh. We quote forging billets \$34 to \$35 and axle billets \$33 to \$34, Pittsburgh.

Ferroalloys.—Little new inquiry is out, most of the ferromanganese being sold being in carload lots which either importers or consumers can furnish for prompt delivery. Such sales are being made at \$59 to \$60, Baltimore. We note a sale of two carloads at \$59.50, and one carload is reported to have been sold at \$60. We quote 80 per cent. English ferromanganese at \$60 to \$60.50, Baltimore, the freight rate to the Pittsburgh district being \$2.16 per ton. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at \$75; over 100 tons to 600 tons, \$74; over 600 tons, \$73, Pittsburgh. We quote 10 per cent. at \$24; 11 per cent., \$23; 12 per cent., \$26, f.o.b. cars at furnace, Jackson, Ohio, or Ashland, Ky. We quote ferro-carbon-titanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, 12½c. in lots up to 2000 lb.

Wire Rods.—The quiet conditions existing in the wire trade are reflected in wire rods. We quote Bessemer, open-hearth and chain rods at nominally \$30, Pittsburgh.

Muck Bar.—Consumers of muck bar that buy in the open market are trying to get in as much as possible prior to July 1 for fear there may be trouble in coming to a settlement of the puddling scale. We note a sale of 1500 tons of high grade muck bar made from a particular brand of pig iron at \$31.50, delivered buyer's mill in the Pittsburgh district. We quote standard grades of local muck bar, made from all pig iron, at \$30.50 to \$31 Pittsburgh. Eastern muck bar is being offered in this market at \$28.50 to \$29 delivered.

Skelp.—The mills are well filled for the next two or three months. A sale of 1500 tons of light gauge narrow grooved skelp is reported at close to 1.55c., delivered buyer's mill in the Pittsburgh district. Prices are firm. We quote: Grooved skelp, 1.45c. to 1.50c.; sheared steel skelp, 1.50c. to 1.55c.; grooved iron skelp, 1.75c. to 1.80c.; sheared iron skelp, 1.85c. to 1.90c., delivered at buyers' mill in the Pittsburgh district.

Steel Rails.—The local interest continues to book good-sized orders for standard sections and light rails for foreign shipment. Work is progressing rapidly on the new open-hearth steel plant being built by the Carnegie Steel Company at Bessemer, and it is expected to have two or three furnaces ready for operation early in August. The Carnegie Steel Company has taken in the past week new orders and specifications for light rails for about 2100 tons. The expected demand from the traction companies has been light, and the amount of business placed so far this year by these interests is considerably less than last year. We quote splice bars at 1.50c. per lb. and standard section rails at 1.25c. per lb. Light rails are quoted as follows: 25, 30, 35, 40 and 45 lb. sections, 1.25c.; 16 and 20 lb., 1.30c.; 12 and 14 lb., 1.35c., and 8 and 10 lb., 1.40c., all in carload lots, f.o.b. Pittsburgh.

Structural Material.—A great deal of work is in sight which may come out later in the year. The Riter-Conley Mfg. Company has taken 2100 tons for a new steel building for the Solvay Process Company, Detroit, Mich., and several smaller contracts. The American Bridge Company has secured about 1800 tons of bridge work to be erected in Ohio and all details have been settled for the building of a 20-story hotel on Smithfield street in this city. The Bethlehem Steel Company will soon commence to deliver the steel for the 13-story building of the Kaufmann-Baer Company in this city, the contract for which it took some time ago. We quote beams and channels up to 15 in. at 1.45c. to 1.50c. Small lots from warehouse for prompt delivery are bringing from 1.60c. up, depending on the size of the order and the deliveries wanted.

Plates.—The Toledo, St. Louis & Western Railroad is in the market for 1000 steel underframe box cars on which the car shops are now figuring. The Seattle Construction & Dry Dock Company, Seattle, Wash., has sent out inquiries for 2000 tons of plates and shapes for a new Government tender which it will build. All the plate mills are well filled for several months, but three or four of the smaller mills are booking new business by promising deliveries in four to six weeks, on which they are naming 1.50c. to 1.60c. for Pitts-

burgh delivery. For $\frac{3}{4}$ in. and heavier tank plate we quote 1.45c. Pittsburgh, for forward shipment.

Iron and Steel Bars.—The new demand for steel bars continues fairly heavy but mills are catching up on their contracts to some extent, specifications recently being only 80 to 85 per cent. of shipments. The heavy advances for puddling and finishing asked by the Amalgamated Association and the Sons of Vulcan may possibly mean some delay in settling the wage scales this year. Most makers of steel bars have work ahead for three or four months, one leading maker refusing to book any new orders for delivery prior to October. The demand for iron bars is less active, but the mills are pretty well filled for several months. Practically all the contracts of the implement makers for steel bars have been placed, and the tonnage involved this year was not as heavy as last year. Prices on steel bars are being firmly held at 1.40c. at mill for forward delivery. We quote iron bars at 1.70c. to 1.75c. for reasonably prompt delivery. Mills charge \$1 extra per ton for twisting $\frac{3}{4}$ in. and larger steel bars and \$2 extra for $\frac{3}{4}$ to $\frac{5}{8}$ in.

Sheets.—The market on sheets is in better condition than for some time. It is said that a few mills are still offering on the basis of 3.40c. for No. 28 galvanized and 2.30c. for No. 28 black, but most of the mills quote higher prices. The demand for sheets is fairly active, and some mills report heavier specifications in the last two weeks as a result of the steadying in prices. We quote No. 10 blue annealed sheets at 1.75c.; No. 28 Bessemer black sheets, 2.30c. to 2.35c.; No. 28 galvanized at 3.40c. to 3.50c., and No. 28 tin mill black plate at 2.30c. These prices are f.o.b. Pittsburgh, in carload and larger lots, jobbers charging the usual advances for small lots from store.

Tin Plate.—There is no improvement in specifications against contracts. Unless large consumers come in more freely in the near future it is not unlikely that a material restriction in output will occur about July or August. The American Sheet & Tin Plate Company is operating to about 89 per cent. of hot tin mill capacity and would be running at a heavier rate but is still short of steel. The new demand is only for small lots. We quote 100-lb. cokes at \$3.60; 100-lb. ternes at \$3.45, and No. 28 black plate for tinning purposes at \$2.30, all f.o.b. Pittsburgh.

Railroad Spikes.—The new demand is quiet and specifications from railroads have fallen off. Some makers of spikes are evidently anxious for new business, as low delivered prices are being made in the Chicago and St. Louis districts. We quote railroad spikes in base sizes, $5\frac{1}{2} \times 9$ -16 in., at \$1.75 to \$1.80, and small railroad and boat spikes in carload and larger lots at \$1.80 to \$1.85 per 100 lb., f.o.b. Pittsburgh.

Bolts and Rivets.—Local makers report the new demand as fair and state that specifications from customers against contracts are coming in quite freely. In some sections, however, conditions are not so good and prices are being shaded about \$2 a ton on rivets and about 5 per cent. on bolts. Regular prices on button-head structural rivets are \$2.20 and on cone-head boiler rivets \$2.30. Regular discounts on bolts are as follows, in lots of 300 lb. or over delivered within a 20c. freight radius of maker's works:

Coach and lag screws	.....80 and 10% off
Small carriage bolts, cut threads	.....75 and 5% off
Small carriage bolts, rolled threads	.....75 and 10% off
Large carriage bolts	.....70% off
Small machine bolts, cut threads	.....75 and 10% off
Small machine bolts, rolled threads	.....75, 10 and 5% off
Large machine bolts	.....70 and 7% off
Machine bolts with C.P.C. and T nuts, small	75 and 5% off
Machine bolts with C.P.C. and T nuts, large	.....70% off
Square hot pressed nuts, blanked and tapped	\$.57 off list
Hexagon nuts	\$.63 off list
C.P.C. and R. square nuts, tapped and blank	\$.57 off list
Hexagon nuts, $\frac{3}{4}$ and larger	\$.66 off list
Hexagon nuts smaller than $\frac{3}{4}$	\$.72 off list
C.P. plain square nuts	\$.52 off list
C.P. plain hexagon nuts	\$.55 off list
Semi-finished hexagon nuts $\frac{3}{4}$ and larger	.....85% off
Semi-finished hex. nuts smaller than $\frac{3}{4}$	.....85 and 10% off
Rivets, $7/16 \times 6\frac{1}{2}$, smaller and shorter	75, 10 and 10% off
Rivets, metallic tinned, bulk	.....3½c. per lb. net extra
Rivets, tin plated, bulk	.....1½c. per lb. net extra
Rivets, metallic tinned, packages	70, 10 and 10% off
Standard cap screws	75, 10, 10 and 7½% off
Standard set screws	75, 10, 10 and 7½% off

Wire Products.—The new demand for wire and wire nails is quiet and specifications against contracts are only fair. Jobbers and consumers are inclined to keep stocks as low as possible in the belief that they will have no trouble in replenishing stocks or getting quick deliveries when they come in the market. Regular prices, which are shaded about \$1 a ton, are as follows: Wire nails, \$1.80, base, per keg; cut nails, \$1.70 to \$1.75;

galvanized barb wire, \$2.20 per 100 lb.; painted, \$1.80; annealed fence wire, \$1.60, and galvanized fence wire, \$2, f.o.b. Pittsburgh, usual terms, freight added to point of delivery. Jobbers charge the usual advances over these prices for small lots from store.

Shafting.—Prices have developed considerable weakness, and on some contracts recently taken 62 per cent. off list was done. On carloads and larger lots we quote cold-rolled shafting at 60 to 62 per cent. off, depending on the order, and on small lots from 53 to 55 per cent. off, delivered in base territory.

Merchant Steel.—Mills are now said to be shipping out material at 25 per cent. or more in excess of specifications and are catching up quite considerably on contracts. One maker states that its shipments in May were the heaviest in any one month this year, but it still has sufficient orders on its books to take its entire output for the next two months. We quote: Iron finished tire, $1\frac{1}{2} \times \frac{1}{2}$ in. and larger, 1.40c. to 1.55c., base; under $\frac{1}{2} \times \frac{1}{2}$ in., 1.55c. to 1.65c.; planished tire, 1.60c. to 1.70c.; channel tire, $\frac{3}{4}$ to $\frac{7}{8}$ and 1 in., 1.90c. to 2c.; $1\frac{1}{2}$ in. and larger, 1.80c. to 1.90c.; toe calk, 2c. to 2.10c., base; flat sleigh shoe, 1.50c. to 1.65c.; concave and convex, 1.80c. to 1.90c.; cutter shoe, tapered or bent, 2.30c. to 2.40c.; spring steel, 2c. to 2.10c.; machinery steel, smooth finish, 1.80c. to 1.85c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and $1\frac{1}{2}$ in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.30c.; soft, 3.55c.; coils, hard, 3.20c.; soft, 3.45c.; freight allowed. The usual differentials apply for lighter gauges and sizes.

Merchant Pipe.—The National Tube Company has taken orders for 180 miles of 8 in., 30 miles of 16 in. and 50 miles of 10 and 12 in. steel pipe. The Logan Natural Gas & Fuel Company has placed a contract with the National Tube Company for 30 miles of 12 in., 30 miles of 10-in. and about 10 miles of 8-in. pipe for a natural gas line to be laid in Ohio. The inquiry of the Texas Company for 100 miles or more of 4 to 6-in. pipe for an oil line has not yet been placed. The new demand for pipe continues fairly heavy and all the mills have from two to three months' actual orders ahead. A leading Eastern pipe mill has advanced prices on iron pipe one point, or \$2 a ton, and others are following. Water casing pipes are higher.

Boiler Tubes.—Effective May 29, the National Tube Company sent out new discounts on steel boiler tubes showing an advance of one point, or \$2 a ton, on 3 and $3\frac{1}{4}$ in. and on $3\frac{1}{2}$ to $4\frac{1}{2}$ in., discounts on the other sizes being unchanged. The new demand for locomotive tubes and seamless steel tubing continues heavy, and all the mills are sold up for three to four months or longer. An early advance in prices of charcoal iron tubes is expected, as the demand for these is strong.

Old Material.—The market does not show any betterment either in demand or prices. It is said that bids made on the Pennsylvania and Baltimore & Ohio lists by local scrap dealers have been the lowest in three or four years. Dealers are now quoting as follows, per gross ton, for delivery in the Pittsburgh and nearby districts:

Heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen and Pittsburgh delivery	.....\$13.00 to \$13.25
No. 1 foundry cast	13.25 to 13.50
No. 2 foundry cast	12.00 to 12.25
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	9.25 to 9.50
Re-rolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	14.50 to 14.75
No. 1 railroad malleable stock	12.50 to 12.75
Grate bars	9.25 to 9.50
Low phosphorus melting stock	15.50 to 15.75
Iron car axles	25.00 to 25.50
Steel car axles	18.00 to 18.25
Locomotive axles, steel	22.00 to 22.50
Locomotive axles, iron	26.50 to 27.00
No. 1 husheling scrap	12.25 to 12.50
No. 2 husheling scrap	8.00 to 8.25
Old carwheels	14.00 to 14.25
*Machine shop turnings	7.00 to 7.25
*Cast-iron borings	8.75 to 9.00
†Sheet bar crop ends	15.00 to 15.25
Old iron rails	15.00 to 15.25
No. 1 railroad wrought scrap	14.25 to 14.50
Heavy steel axle turnings	10.50 to 10.75
Stove plate	9.25 to 9.50

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.

†Shipping point.

Coke.—The serious declines in prices of pig iron have not as yet affected coke, prices on which continue firm. There is still a deadlock on between producers of coke and the furnace operators for last half. Standard grades of furnace coke for prompt delivery are firm, and we note sales of 6000 to 8000 tons at \$2.15 to \$2.20 per net ton at oven. On standard makes of

furnace coke for last half some operators are said to have sold at \$2.25 at oven. We continue to quote standard makes of foundry coke for last half at \$3 to \$3.20 per net ton at oven. The Connellsville Courier gives the output of coke last week as 396,904 tons, a decrease over the previous week of about 12,500 tons.

Chicago

CHICAGO, ILL., June 4, 1913.—(By Telegraph.)

Consumers as well as producers of steel mill products in this market look upon the present lull in new business as temporary. The approaching end of the fiscal year is considered sufficient explanation for the cessation of railroad buying. Good crops, it is believed, will make the purchase of additional equipment necessary and favorable legislation as to freight rates will make possible the required financing. Melters of pig iron, especially malleable, see little possibility of reduced contract tonnages during the last half, and the month of June is expected to witness the closing of many contracts for both castings and pig iron. At the present time the local pig iron market is at a standstill, with a reduction in active furnace capacity imminent. Structural materials, including shapes and plates, are now obtainable from mill in four weeks, though this condition is not general for all sizes or all mills. Fabricators are still carrying large stocks and are accordingly out of the market. The sympathetic weakness in galvanized sheets continues to parallel spelter values. In a few instances, bar iron has been sold at concessions. The scrap market is more stagnant than at any time in recent months and quotations, though reduced, are still nominal.

Pig Iron.—Encouragement as to the possibilities of the local pig-iron market during the week has come rather from other territory than from developments at home. In some territories Southern iron apparently has begun to move, and this suggests the likelihood of a turning point where now the trade is marking time. With the exception of concessions in charcoal iron prices, which have made delivery at Chicago possible on the basis of \$17.50, there have been no changes in price during the week. The continuance of the present situation will undoubtedly result in the blowing out of two furnaces in this district. The most promising phase of the situation is the proximity of the second half, now less than 30 days distant. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 1, 2, 3, 4.....	\$17.50 to \$18.00
Northern coke foundry, No. 1.....	16.75 to 17.25
Northern coke foundry, No. 2.....	16.00 to 16.75
Northern coke foundry, No. 3.....	15.50 to 16.00
Southern coke, No. 1 foundry and No. 1 soft.....	16.35 to 16.85
Southern coke, No. 2 foundry and No. 2 soft.....	15.85 to 16.35
Southern coke, No. 3.....	15.35 to 15.85
Southern coke, No. 4.....	14.85 to 15.35
Southern gray forge.....	14.85 to 15.35
Southern mottled.....	14.85 to 15.35
Malleable Bessemer.....	16.00 to 16.50
Standard Bessemer.....	19.40 to 19.90
Basic.....	16.00 to 16.50
Jackson Co. and Kentucky silvery, 6 per cent.....	20.40
Jackson Co. and Kentucky silvery, 8 per cent.....	21.40
Jackson Co. and Kentucky silvery, 10 per cent.....	22.40

(By Mail)

Rails and Track Supplies.—Reports of the railroad attitude on buying during the past week indicate a close limitation of purchases, in this territory at least, to the minor necessities. Those disposed to view the situation favorably look for a resumption of buying with the new fiscal year. Inquiry for 1914 rails has appeared, but in a casual sort of way only. Specifications show no relaxation in the desire to secure delivery of all material on order. We quote standard railroad spikes at 1.00c. to 2c., base; track bolts with square nuts, 2.30c. to 2.40c., base, all in carload lots, Chicago; tie plates, \$33 to \$35 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open-hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Materials.—The outlook for new work in fabricated steel is moderately good though the tonnage in prospect is perhaps less impressive because rather widely scattered and involving no very large jobs. A rather better than average prospect for highway bridge work is reported throughout the Mississippi Valley, and in the Rocky Mountain district addition-

al smelter construction is under consideration. Contracts for fabricated steel reported placed since the last review total about 5000 tons, of which 2000 tons will be furnished by Dyer Bros. for the Auditorium, Oakland, Cal. The Toledo Bridge & Crane Company took the order for 360 tons for a bridge at East Chicago, Ind.; Central Iron Works will furnish 200 tons for the Gottschalk department store at Fresno, Cal.; Pacific Rolling Mill Company, 682 tons for the Carlston-Snyder Building, Oakland, Cal.; American Bridge Company, 153 tons for two turntables for the St. Louis Southwestern and 378 tons for a bridge for the Utah Railway; Pennsylvania Steel Company, three turntables for the Rock Island; South Halsted Street Iron Works, 470 tons for a cold storage building for the Independent Packing Company, Chicago; Minneapolis Steel & Machinery Company, 165 tons for a coliseum for the Utah State Fair Association, Salt Lake City. The William R. Hearst Building at Los Angeles, which figured 500 tons in steel, will be a reinforced concrete building. The amount of work in the shops of fabricators throughout this district varies from enough to occupy capacity for a few weeks up to two months. In a few instances only is there an immediate need for business. Fabricators have been and are still handicapped by the necessity for carrying large stocks of steel because of the situation that has prevailed with reference to mill deliveries. This situation has now improved, and while delivery within three to four weeks is by no means general nor applicable to all sizes, such shipment is being made on a number of orders placed with the largest independent mills of the Pittsburgh and eastern Pennsylvania districts. We continue to quote for Chicago delivery, mill shipment, 1.63c. to 1.68c.

For orders calling for pieces requiring special cutting and in small number, the warehouse activity continues to reflect a steady demand. We quote for Chicago delivery from store, 2.05c.

Plates.—The most aggressive selling of finished steel among the various products is probably traceable to those makers of plates who, when buying was at its height, were taking only such business as they could deliver with promptness sufficient to command a premium and now find themselves with little forward business on their books and a still more limited demand. Premium offers are now quite unnecessary, and 1.50c., Pittsburgh, is a very acceptable price from the mill standpoint. Railroad buying of rolling stock in this market is light and inquiries are not impressive. The International & Great Northern will buy 200 coal cars and 300 box cars and the Chicago Mill & Lumber Company is in the market for several hundred flat cars. The Pullman Company secured half of the Lehigh Valley order for 2000 cars. For Chicago delivery, mill shipment, we quote 1.63c. to 1.68c.

The ordering of plates from warehouse continues of a desultory character and prices are unchanged. We quote for Chicago delivery, 2.05c.

Sheets.—Although the concessions from regular prices still prevalent in quotations on galvanized sheets are as pronounced as at any time, the differential above black sheets continues satisfactory, the shading of prices being absorbed by the decline in spelter values. There is little apparent pressure on black sheet prices, notwithstanding shipments are exceeding specifications. We quote for Chicago delivery in carloads from mill: No. 28 black sheets, 2.53c.; No. 28 galvanized, 3.53c. to 3.68c.; No. 10 blue annealed, 1.93c.

We quote store prices without change as follows: No. 10 blue annealed, 2.25c.; No. 28 black, 2.90c.; No. 28 galvanized, 4.15c.

Bars.—In contrast with reports of a lull in the demand for steel products in general, specifications on steel bar contracts are heavy. The placing of new contracts is also proceeding in a quiet way, which, though longer delayed than usual, is a reflection of the acknowledged stability of the price rather than any uncertainty as to tonnage requirements. Reports of weakness in bar iron in this market have been accorded enhanced importance because of the more general concessions in other markets. Certain orders of small tonnage for early shipment have been taken in this market by one maker of bar iron at 1.50c., but this is still an isolated price and not the general basis for contracting. At the same time the absence of demand, which is now quite obvious, does not make for strength in the situation. We quote for mill shipment as follows: Bar iron, 1.50c. to 1.57½c.; soft steel bars, 1.58c.; hard steel bars, 1.60c.; shafting in carloads, 58 per cent. off; less than carloads, 53 per cent. off.

For delivery from store, we quote soft steel bars, 1.95c.; bar iron, 1.85c.; reinforcing bars, 1.95c. base with 5c. extra for twisting in sizes 3 in. and over, and usual card extras for smaller sizes; shelling 3 per cent. off.

Rivets and Bolts.—Quotations on rivets in this market are being made at such concessions that one of the local makers is diverting its steel for rivets and holding it for sale in bar form. The nut and bolt market likewise continues ragged. We quote from mill as follows: Carriage bolts up to $\frac{3}{8}$ x 6 in., rolled thread, 75-10; cut thread, 75-5; larger sizes, 70-2½; machine bolts up to $\frac{3}{8}$ x 4 in., rolled thread, 70-10-5; cut thread, 75-10; large size, 70-7½; coach screws, 80-10; hot pressed nuts, square head, \$5.70 off per cwt.; hexagon, \$6.30 off per cwt. Structural rivets, $\frac{3}{4}$ to 1½ in., 2.38c., base, Chicago, in carload lots; boiler rivets, 0.10c. additional.

Out of store we quote for structural rivets, 2.70c., and for boiler rivets, 2.90c. Machine bolts up to $\frac{3}{8}$ x 4 in., 70-7½; larger sizes, 65-5; carriage bolts up to $\frac{3}{8}$ x 6 in., 70-5; larger sizes, 65 off. Hot pressed nuts, square head, \$5.30, and hexagon, \$5.90 off per cwt.

Wire Products.—With the steel post sales of the leading interest for the first five months of the year exceeding the total sales for 1912, the trade in fencing is being developed in new avenues of considerable importance. In general, the shipment of wire products is hardly up to the expectations warranted by the order tonnage on the books. It is reported, however, that wire nails and barb wire are now moving more actively through retail channels. We quote as follows to jobbers: Plain wire, No. 9 and coarser, base, \$1.78; wire nails, \$1.08; painted barb wire, \$1.08; galvanized, \$2.38; polished staples, \$1.08; galvanized, \$2.33, all Chicago.

Cast-Iron Pipe.—The conservatism prevalent for some time as applied to financing by bond issues is pointedly apparent in the marketing of pipe. At the present time 6000 tons at Portland, Ore., and 700 tons at Bloomington, Ill., are being held because of inability to finance the improvements. The small tonnage of pipe now being manufactured has a direct bearing on the pig-iron situation, particularly in the South, where last year nearly 1,000,000 tons of pig iron was taken by the pipe companies. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$28.50; 6 to 12 in., \$26.50; 16 in. and up, \$25.50, with \$1 extra for gas pipe.

Old Materials.—While the situation here is more favorable as regards scrap, by reason of the raising of the embargo at the Indiana Harbor Works of the Inland Steel Company, that clearance is of little avail in view of the continued lack of consumers' demand. Even the activity among the various dealers incident to the filling of old orders will soon cease, with the general maturity of those orders July 1. Some quotations rather startling in their indications of weakness have been made, but the general list of prices is not greatly changed in the absence of important trading. New offerings of railroad scrap include approximately 5300 tons by the Chicago & Northwestern, and 25,000 tons by the Baltimore & Ohio scattered over its entire system. The Lake Shore and the Erie have issued blank lists. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.

Old iron rails	\$15.75 to \$16.25
Old steel rails, rerolling	13.25 to 13.75
Old steel rails, less than 3 ft.	11.75 to 12.25
Relaying rails, standard section, subject to inspection	24.00
Old carwheels	14.25 to 14.75
Heavy melting steel scrap	10.50 to 11.00
Frogs, switches and guards, cut apart	10.50 to 11.00
Shoveling steel	10.25 to 10.75
Steel axle turnings	8.50 to 9.00

Per Net Ton.

Iron angles and splice bars	\$15.00 to \$15.50
Iron arch bars and transoms	14.50 to 15.00
Steel angle bars	10.25 to 10.75
Iron car axles	19.75 to 21.25
Steel car axles	17.25 to 17.75
No. 1 railroad wrought	10.75 to 11.25
No. 2 railroad wrought	10.00 to 10.50
Cut forge	10.00 to 10.50
Steel knuckles and couplers	11.25 to 11.75
Steel springs	11.50 to 12.00
Locomotive tires, smooth	12.25 to 12.75
Machine shop turnings	5.25 to 5.75
Cast and mixed borings	5.00 to 5.50
No. 1 busheling	9.00 to 9.50
No. 2 busheling	6.75 to 7.25
No. 1 boilers, cut to sheets and rings	7.75 to 8.25
Boiler punchings	12.25 to 12.75
No. 1 cast scrap	11.00 to 11.50
Stove plate and light cast scrap	9.25 to 9.75
Railroad malleable	11.50 to 12.00
Agricultural malleable	10.25 to 10.75
Pipes and flues	8.00 to 8.50

Philadelphia

PHILADELPHIA, PA., June 3, 1913.

A greater volume of business has developed in foundry pig iron; pipe makers, railroads and locomotive builders being the principal inquirers. The market is believed to be close to the bottom. In some lines of finished products inquiries are more promising. Negotiations are under way for ship plates aggregating about 20,000 tons, covering three vessels for the Mallory line, a Southern Pacific tanker and one other vessel, all large boats. Delaware River shipbuilders are now pretty well filled up, not only for this year but also for a good part of next year. While no heavy rail sales have been reported, inquiry for 1914 delivery has begun to develop. Western billet consumers are again making inquiries for round tonnages. Some mills report orders as 60 per cent. below the volume of two months ago, but they are receiving heavy specifications against old contracts and full capacity activity is assured for some months. In the old material market heavy melting steel scrap is more active at \$12, delivered, but other grades are quiet.

Iron Ore.—The market is extremely quiet. The longshoremen's strike has practically been broken and the unloading of foreign ore proceeds with little difficulty. Importations during the week included 5000 tons from Canada and 12,299 tons from Sweden.

Pig Iron.—The past week has brought out heavier inquiries for foundry grades than for several months, and producers are encouraged by the prospect for a resumption in buying. Cast-iron pipe makers have been considering large purchases and one interest on the upper Delaware has been purchasing against inquiries aggregating 10,000 tons, orders being divided among various producers in lots of 1000 tons or more at prices reported between \$15.25 and \$15.50, delivered. Pipe makers in this immediate vicinity would probably take from 10,000 to 15,000 tons at a price, and one interest has made some purchases taking one lot of several thousand tons. Southern iron is figuring quite extensively in the negotiations. Probably the most important new inquiry in this district is that of the Pennsylvania Railroad, which is asking for a minimum of 4500 and maximum of 9000 tons for third quarter delivery at Altoona. This inquiry covers 500 to 1000 tons of Southern charcoal, 650 to 1300 tons of Northern charcoal, 1800 to 3600 tons of low silicon and 1600 to 3100 tons of high silicon coke foundry iron. The Baldwin Locomotive Works is asking for 1000 to 2000 tons of cylinder grade foundry iron for early delivery. A malleable iron foundry has come out for 1000 tons of coke malleable, and general gray iron foundries have been more active inquirers for moderate lots. The latter class of buyers still purchase conservatively, although with the present increase in demand they are expected to become more active buyers. Notwithstanding the increasing volume of business, prices of foundry iron continue irregular. On general business the range for standard brands of No. 2 X is from \$16.50 to \$16.75, delivered here. In exceptional instances, where competition is sharp and favorable freights are available, concessions of 10c. to 15c. from the inside price have been made, while on the other hand \$17, delivered, is obtained from some small buyers, who are willing to pay slight premiums rather than change their mix. Some producers still consider the proposition of reducing output as present selling prices are unremunerative. Virginia producers are making moderate sales at \$14 at furnace for No. 2 X foundry, equal to \$16.80 delivered here, but report inquiry light. Rolling mill forge is practically at a standstill and is quoted nominally at \$15.75 delivered. In the steel-making grades, basic is uncalled for and nominally quoted at \$16.50 delivered. A carload sale at \$16 at furnace was recently made. Small sales of standard analysis low phosphorus iron have been made at prices equal to \$23.50 here. An aggregate of several thousand tons of Lebanon Valley low phosphorus was sold by one maker at \$19 at furnace. The following quotations about represent the market for standard brands, delivered in buyers' yards in this district:

Eastern Pennsylvania No. 2 X foundry	\$16.50 to \$16.75
Eastern Pennsylvania No. 2 plain	16.25 to 16.50
Virginia No. 2 X foundry	16.80 to 17.00
Virginia No. 2 plain	16.55 to 16.75
Gray forge (nominal)	15.75
Basic (nominal)	16.50
Standard low phosphorus	23.50

Ferroalloys.—Occasional sales of carloads of 80 per cent. ferromanganese continue to be made. While \$61, seaboard, has been done, this price has been shaded down to \$59.50. The lower price is dependent on the

availability of the material, ends of export arrivals usually being sold at the lower figure to avoid placing in store. Some inquiry for forward ferromanganese has developed, but at \$61 no business has been done. Recent importations of ferromanganese aggregate 1400 tons. Ferrosilicon remains quiet.

Billets.—Eastern mills have received inquiries for 15,000 tons of rolling billets from one and 6000 tons from another Western consumer, for third quarter. Inquiries aggregating 3000 tons have also come to one mill from Eastern consumers. Mills are practically filled for June delivery and will carry considerable unfilled tonnage over into July. For third quarter, mills in this district still quote \$28 delivered here for rolling steel. Consumers continue to urge mills for delivery on orders, but makers operating at full capacity are unable to meet the demand. Ordinary forging steel is firm at \$34, minimum, Eastern mill.

Plates.—A satisfactory run of miscellaneous business continues to come out, which, together with specifications on old orders, about equals the rate of production at Eastern mills. A few contracts for third quarter are being entered at full prices. Considerable new business has come up in ship plates, Delaware River builders asking prices for purposes of bidding on five large boats, aggregating 15,000 to 20,000 tons of plates. Locomotive, bridge and boiler plates are in active demand. While Western plates are available at 1.60c. to 1.65c. for near future delivery in this district, Eastern mills making even better shipments still adhere to 1.75c., delivered here.

Structural Material.—New business has not been heavy. In fabricated work the majority of the projects are small, although some large business, such as the Ritz-Carlton addition, is in sight. In plain material orders have been for small lots. Mills are still well covered on the smaller sizes, but can make reasonably prompt deliveries on the heavier shapes, which may be had at the general base price for Western plain shapes, namely, 1.60c. to 1.65c., delivered in this district. On the smaller shapes as high as 1.75c., mill is asked for early shipments.

Sheets.—The demand continues active, although there is little forward buying. Specifications and new orders about equal the productive rate at Eastern mills. Consumers continue to urge mills for prompt shipments. Prices are unchanged, Western No. 10 blue annealed sheets being quoted at 1.90c., delivered here, while Eastern mills making smooth loose-rolled sheets occasionally obtain 1.95c. here for prompt deliveries.

Bars.—With the lighter demand for iron bars has come sharper competition for business offered, and while prices are not quotably lower it is reported that concessions have been made for desirable business. Ordinary iron bars are weak at 1.50c., Eastern mill, or 1.57½c. delivered in this vicinity. The better grades still command somewhat higher prices. There has been little movement in steel bars, which are quoted at 1.55c. to 1.60c. here.

Old Material.—Consumers of heavy melting steel scrap have shown more interest in the market. Moderate lots of No. 1 heavy melting stock have been sold at \$12, delivered, and other melters are understood to be willing to pay that price for June, July and August delivery. Better than \$12, delivered, has, in instances, been bid on railroad steel on the lists out this month. Business in other grades of scrap has been dull. Rolling mill grades can be moved only at a concession. Old car wheels are inclined to be weak. Quotations are practically nominal in all grades, but the following range about represents prices at which small transactions might be made for delivery in buyers' yards in this district, covering eastern Pennsylvania, taking freight rates varying from 35c. to \$1.35 per gross ton:

No. 1 heavy melting steel	\$12.00
Old steel rails, rerolling (nominal)	\$15.00 to 15.50
Low phosphorus heavy melting steel scrap	17.00 to 17.50
Old steel axles (nominal)	17.50 to 18.00
Old iron axles (nominal)	26.00 to 27.00
Old iron rails	18.00 to 18.50
Old carwheels	13.50 to 14.00
No. 1 railroad wrought	15.00 to 15.50
Wrought-iron pipe	12.00 to 12.50
No. 1 forge fire	11.00 to 11.50
No. 2 light iron (nominal)	6.75 to 7.25
No. 2 cut busheling	8.50 to 9.00
Wrought turnings	8.50 to 9.00
Cast borings	8.75 to 9.25
Machinery cast	13.50 to 14.00
Grate bars, railroad	10.00 to 10.50
Stove plate	10.00 to 10.50
Railroad malleable (nominal)	12.00

Coke.—A moderate movement in both prompt and contract foundry coke continues. The better grades

are quoted at \$3.20 at oven, although as low as \$2.75 can be done. Furnace coke has been quieter. No new business in contract coke has developed, although small lots of spot furnace coke have been sold. Prices are unchanged, the following range per net ton about representing the market for delivery in buyers' yards in this district:

Connellsville furnace coke	\$4.05 to \$4.50
Connellsville foundry coke	4.90 to 5.35
Mountain furnace coke	3.75 to 4.10
Mountain foundry coke	4.50 to 5.00

Cleveland

CLEVELAND, OHIO, June 2, 1913.

Iron Ore.—There is a limited buying of small lots of ore and one deal is pending involving 20,000 tons. The market is firm at regular prices. With better weather conditions delays in the movement, which made May shipments less than expected, have about disappeared and ore is now coming down the lakes at a satisfactory rate. A very heavy movement during June is looked for. We quote prices as follows: Old range Bessemer, \$4.40; Mesaba Bessemer, \$4.15; old range non-Bessemer, \$3.60; Mesaba non-Bessemer, \$3.40.

Pig Iron.—The market continues quiet. Foundries generally are delaying their buying for the last half in order to secure lower prices should sellers make further concessions. Some indications that the bottom has been reached are shown by late quotations which are no lower than last week. While No. 2 foundry has been quoted as low as \$14.25, it is claimed that this price has been named only for shipment to one or two points where there is competition from furnaces outside of the Cleveland and Valley districts. The market in this territory appears to be well maintained at \$14.50 for No. 2. One northern Ohio consumer has bought 400 tons at that price for the last half after receiving several quotations, none of which was at a lower figure. Several other small lot sales are reported at the same price. A Cleveland furnace interest continues to offer No. 2 foundry at \$15, delivered in this city. Local sellers have received an inquiry from the Colonial Steel Company for 1500 tons of basic for June delivery and for 1000 to 1500 tons per month during the third quarter. Southern iron is weaker. At least one Alabama interest is offering No. 2 Southern at \$11, Birmingham, for the last half. Others are asking from \$11.25 to \$11.50. For prompt shipment during the remainder of the year, we quote delivered Cleveland as follows:

Bessemer	\$17.50
Basic	\$15.65 to 15.90
Northern No. 2 foundry	15.00 to 15.25
Southern No. 2 foundry	15.35 to 15.85
Gray forge	14.75
Jackson County silvery, 8 per cent. silicon	20.55

Coke.—The market continues dull but firm. Some inquiries are coming out for last half contracts for foundry grade, but consumers are delaying the placing of orders. While some fairly good foundry coke is being offered at \$2.75, standard grades are being quoted at \$3 to \$3.25 per net ton or oven both for spot shipment and contract. Wise County, Virginia, foundry coke is quoted at \$2.75.

Finished Iron and Steel.—Reports from practically all sellers indicate some improvement in specifications and a better volume of inquiry. Some new contracts for the last half and the last quarter have been placed at 1.40c. for steel bars and 1.50c. for plates and structural material. Steel bars can be had at 1.40c. for early delivery. For prompt shipment 1.45c. to 1.50c. is being asked. There is further weakness in the bar iron market due to price concessions of Chicago mills, which are making quotations ranging from 1.45c. to 1.47c. Cleveland mills are now asking 1.60c. The demand is light. Plates and shapes are quoted at 1.55c. to 1.60c. for prompt delivery. Eastern mills have reduced prices \$2 per ton on plates and shapes for Western shipment and are now quoting 1.50c. for desirable lots for early delivery. Specifications are out for the new May Company building in Cleveland, which will require 6000 to 8000 tons of steel, bids for which will be received June 10 by D. H. Burnham & Company, architects, Chicago. The specifications call for Bethlehem sections, but alternative bids will be received. There is an inquiry out for 500 tons of reinforcing bars for a new warehouse to be built by the H. C. Christy Company, Cleveland. The demand for sheets is moderate and the minimum price appears to be 2.30c. for No. 28 black and 3.40c.

for No. 28 galvanized. Bolts are firm. The recent large inquiry from interests allied with the automobile trade for contracts for a year are reported not to have yet been placed, buyers waiting with the hope of getting better prices. The rivet market is weak and new demand is light. Consumers generally are covered with contracts and no large inquiries are coming out. Structural rivets are quoted at 2c. Pittsburgh, and boiler rivets at 2.10c., but this price might possibly be shaded on desirable orders. Warehouse prices are unchanged at 2.10c. for steel bars and 2.25c. for plates and structural material.

Old Material.—Demand is very light and prices on several grades have further declined. One local mill is still offering \$11.50 for heavy melting steel, but apparently very little can be had at that price. This consumer has bought a small amount at \$11.75. Another local mill is again accepting shipments, which were suspended for a time. Dealers are making an effort to make deliveries promptly, as both mills and dealers generally are cancelling orders not filled according to contracts. We quote f.o.b. Cleveland, as follows:

Per Gross Ton.

Old steel rails, rerolling	\$14.00 to \$14.50
Old iron rails	15.50 to 16.00
Steel car axles	18.00 to 18.50
Heavy melting steel	11.50 to 11.75
Old carwheels	13.75 to 14.00
Relaying rails, 50 lb. and over.....	23.00 to 25.00
Agricultural malleable	11.75 to 12.00
Railroad malleable	13.00 to 13.25
Light bundled sheet scrap	9.00 to 9.50

Per Net Ton.

Iron car axles	\$20.50 to \$21.00
Cast borings	6.25 to 6.50
Iron and steel turnings and drillings.....	4.75
Steel axle turnings	8.00 to 8.50
No. 1 busheling	10.00 to 10.25
No. 1 railroad wrought	12.00 to 12.50
No. 1 cast	11.75 to 12.00
Stove plate	8.00 to 8.50
Banded tin scrap	11.00 to 11.50

Cincinnati

(By Telegraph)

CINCINNATI, OHIO, June 4, 1913.

Pig Iron.—Southern prices continue to show weakness. Standard brands of both Tennessee and Alabama iron can be obtained at \$11, Birmingham basis, for last half shipment. It is reported that a number of small orders were quietly placed at this figure before it was openly quoted, but the total tonnage booked is far below normal for this season of the year and, unless consumers adopt a strictly hand-to-mouth method of buying, last half requirements will soon force out some heavy inquiries. The majority of melters who have been awaiting the \$11 quotation before purchasing now profess to believe that a still lower level will be reached, but general conditions do not bear them out in this prediction. Northern foundry iron is at a standstill; the furnaces are not willing to sell below \$15, Ironton basis, and the long range between Southern and Northern prices makes this figure prohibitive in all markets. The high cost of coke and labor has exerted a restraining influence in the shading of Northern iron quotations and furnace operators claim they will blow out before meeting Southern competition at its present level. Basic users are withholding all purchases, claiming that present prices are not to their liking. Malleable is also quiet. About the largest sale made in this territory was 1000 tons of Southern No. 2 foundry at \$11, Birmingham, for last half shipment. Few inquiries are before the trade, and the majority of those under negotiation are simply looked on as feelers put out to keep the buyers in touch with the market. Based on freight rates of \$3.25 from Birmingham and \$1.20 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry and 1 soft.....	\$14.75 to \$15.25
Southern coke, No. 2 foundry and 2 soft.....	14.25 to 14.75
Southern coke, No. 3 foundry.....	13.75 to 14.25
Southern, No. 4 foundry.....	13.25 to 13.75
Southern gray forge.....	12.75 to 13.25
Ohio silvery, 8 per cent. silicon.....	20.20 to 20.70
Southern Ohio coke, No. 1.....	17.20 to 17.70
Southern Ohio coke, No. 2.....	16.20 to 16.70
Southern Ohio coke, No. 3.....	15.95 to 16.45
Southern Ohio Malleable Bessemer	16.20
Basic, Northern	16.20 to 16.45
Lake Superior charcoal	18.75 to 19.25
Standard Southern carwheel	27.25 to 27.75

(By Mail)

Coke.—Blast furnace operators and coke producers are deadlocked in their views as to prices. While prompt 48-hr. coke is obtainable in small lots for prompt shipment at \$2.20 to \$2.25 per net ton at oven in all three producing districts, last half quotations are

\$2.50 to \$2.60. It is reported that the oven operators are not willing to take on contract business below the minimum figure named. As a consequence there is little contracting in this territory, although it is rumored that two of the Hanging Rock furnaces closed for their last half requirements with Pocahontas producers. Foundry coke is more active, and numerous contracts are reported, with the average price in all producing districts placed at \$3 per net ton at oven, some brands being obtainable as low as \$2.75, while others are held at \$3.25.

Finished Material.—The local sheet mill reports specifications coming in at a satisfactory rate, with new business making a better showing than 30 days ago. Structural material is also in better demand. The railroads are reported to be heavy purchasers of both track and structural material. Local warehouse quotations on steel bars range from 2.10c. to 2.15c. and on structural material from 2.15c. to 2.20c. Blue annealed No. 10 sheets, from stock, are unchanged at 2.40c.

Old Material.—The market has slumped again and it is difficult to ascertain exactly what present quotations should be. While the rolling mills are now consuming a fair quantity of scrap, the amount being offered by the railroads and others is sufficient to keep yard stocks up to maximum. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards:

Per Gross Ton.

Bundled sheet scrap	\$7.50 to \$8.00
Old iron rails	12.75 to 13.25
Relaying rails, 50 lb. and up.....	19.75 to 20.25
Rerolling steel rails	11.75 to 12.25
Melting steel rails	9.75 to 10.25
Old carwheels	11.50 to 12.00

Per Net Ton.

No. 1 railroad wrought	\$9.75 to \$10.25
Cast borings	5.00 to 5.50
Steel turnings	5.00 to 5.50
No. 1 cast scrap	9.50 to 10.00
Burnt scrap	6.75 to 7.25
Old iron axles	17.00 to 17.50
Locomotive tires (smooth inside).....	10.75 to 11.25
Pipes and flues	6.25 to 6.75
Malleable and steel scrap	8.00 to 8.50
Railroad tank and sheet scrap	5.00 to 5.50

Birmingham

BIRMINGHAM, ALA., June 2, 1913.

Pig Iron.—Prices obtained by pig-iron producers in this district recently, according to statements made by furnace operators, have ranged from \$11.50 for sizable lots to \$12 for early delivery and small lots in Southern territory. One operator says his company has just sold one lot of 1500 tons and two others of 500 and 600 tons, respectively, on the \$11.50 basis. These are the largest transactions noted during the week. Another furnace interest, not a large producer, has for some time adhered to the \$12 basis and has refrained from selling anything under that, the price being gotten for rush orders in small quantities. A large furnace company quotes \$11.50 on large lots but with no anxiety to sell. Brokers report hearing in a general way of sales made under \$11.50, but no instances of such transactions are afforded. There seems some doubt whether Alabama furnace men will go below present prices, probably preferring to shut down if necessary. Two large blast furnaces have been blown out, the Sloss-Sheffield, at Florence, following close on the heels of one of the Republic Iron & Steel Company at Thomas. The following quotations, per gross ton, f.o.b. furnaces, reflect the apparent high and low prices in Alabama.

No. 1 foundry and soft.....	\$12.00 to \$12.50
No. 2 foundry and soft.....	11.50 to 12.00
No. 3 foundry.....	11.00 to 11.50
No. 4 foundry.....	10.50 to 11.00
Gray forge	10.00 to 10.50
Basic	11.50 to 12.00
Charcoal	24.50 to 25.00

Cast Iron Pipe.—Outside of a considerable tonnage of water pipe for California points, which is being worked on at the Bessemer plant of the leading interest, there continues a scarcity of orders for the large sizes and some pits are down. Smaller sizes are more in demand, but the volume of business is still comparatively light. Soil pipe is moving in fair quantities and the output will shortly be added to by the rebuilt plant of the Southern Pipe & Foundry Company at North Birmingham. Nominal quotations are \$22.50 for 4 in. and \$20.50 for 6 in. and upward, with \$1 added for gas pipe.

Coal and Coke.—Coke continues in demand above the output, with prices per net ton, f.o.b. oven, as follows: Furnace, \$3.25 to \$3.50; foundry, \$3.50 to \$4.25. Additional inquiries have been received from Texas and California. An increase in the size of contracts for Alabama coal at New Orleans, Mobile and Pensacola is reported, indicating larger movements in the early fall. Some New Orleans contracts with Pittsburgh operators now expiring are reported as being transferred to Alabama producers.

Old Material.—Trading is irregular and prices are fluctuating. Stocks are not increasing. Nominal prices, per gross ton, f.o.b. dealers' yards, are as follows:

Old iron axles	\$15.00 to \$15.50
Old steel axles	15.00 to 15.50
Old iron rails	13.50 to 14.00
No. 1 railroad wrought	12.50 to 13.00
No. 2 railroad wrought	10.50 to 11.50
No. 1 country wrought	10.00 to 10.50
No. 2 country wrought	9.00 to 9.50
No. 1 machinery cast	10.00 to 10.50
No. 1 steel scrap	10.50 to 11.00
Tram carwheels	11.00 to 11.50
Standard carwheels	12.00 to 12.50
Light cast and stove plates	8.50 to 9.00

St. Louis

St. Louis, Mo., June 2, 1913.

Pig Iron.—There has been considerable activity in small lots, but sales failed to run over 300 tons in any individual transaction. The buying came from practically all directions, indicating that not only is there active melting still going on, but also that melters are disinclined to buy in more than a hand-to-mouth way until they can arrive at a more certain feeling as to the future. Low prices are not developing any new transactions of moment.

Finished Iron and Steel.—Standard rail transactions were all in small lots for special purposes. Light rails are in light request, it being the off season for both coal and lumber consumers. Track fastenings are reported quiet. The demand for structural material is fair but only in small lots, there being no particular desire to contract ahead. Fabricating shops are busy, but are not stocking their yards ahead to any great extent. Customers are taking their allotments under original contracts and show no disposition to halt the movement of their material. The only contract of size was for 2000 tons for the Waters-Pierce oil refinery at Sand Springs, Okla. Bars are in excellent demand. Reinforcing bars are also in good request. There is but little bridge work coming out in this territory at present. The only new car contract of the week was one for 1000 cars from the International & Great Northern to the American Car & Foundry Company.

Old Material.—Prices are, if anything, a little lower all along the line. Dealers are doing a little trading among themselves, but the mills are not buying. Re-laying rails are still in sharp request, but there are no supplies to meet the demand. The railroads are putting out lists which serve to add to the depression in the market. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton.

Old iron rails	\$11.75 to \$12.25
Old steel rails, rerolling	11.75 to 12.25
Old steel rails, less than 3 ft.	9.75 to 10.25
Relaying rails, standard section, subject to inspection	22.50 to 23.50
Old car wheels	12.50 to 13.00
Heavy melting steel scrap	10.00 to 10.50
Frogs, switches and guards cut apart	9.50 to 10.00

Per Net Ton.

Iron fish plates	\$10.50 to \$11.00
Iron car axles	18.00 to 18.50
Steel car axles	15.50 to 16.00
Wrought arch bars and transoms	13.00 to 13.50
No. 1 railroad wrought	9.75 to 10.25
No. 2 railroad wrought	9.25 to 9.75
Railway springs	8.00 to 8.50
Steel couplers and knuckles	8.00 to 8.50
Locomotive tires, smooth	10.00 to 10.50
No. 1 dealers' forge	6.50 to 7.00
Mixed borings	4.75 to 5.25
No. 1 busheling	8.00 to 8.50
No. 1 boilers, cut to sheets and rings	5.00 to 5.50
No. 1 cast scrap	8.00 to 8.50
Stove plate and light cast scrap	7.00 to 7.50
Railroad malleable	8.50 to 9.00
Agricultural malleable	7.00 to 7.50
Pipes and flues	5.50 to 6.00
Railroad sheet and tank scrap	4.75 to 5.25
Railroad grate bars	6.00 to 6.50
Machine shop turnings	5.75 to 6.25
Bundled sheet scrap	4.75 to 5.25

Coke.—There is a firmer feeling and contract as well as spot Connellsville best 72-hr. selected is quoted

at \$3 per ton at oven, though an attractive contract could, perhaps, be closed for a shade less than that figure. Very little doing in furnace coke. Virginia and by-product cokes are on a parity with the Connellsville quotation.

Boston

Boston, Mass., June 3, 1913.

Old Material.—The market is exceedingly dull. The dealers express little confidence that the summer will see much if any improvement. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of \$2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	\$9.00 to \$9.50
Low phosphorus steel	13.50 to 14.50
Old steel axles	13.50 to 14.00
Old iron axles	21.00 to 21.50
Mixed shafting	13.00 to 13.25
No. 1 wrought and soft steel	10.25 to 10.50
Skeleton (bundled)	7.50 to 8.00
Wrought-iron pipe	8.50 to 9.00
Cotton ties (bundled)	8.50 to 9.00
No. 2 light	3.50 to 4.00
Wrought turnings	5.50 to 6.00
Cast borings	5.50 to 6.00
Machinery, cast	11.50 to 12.00
Malleable	10.00 to 10.50
Stove plate	7.75 to 8.25
Grate bars	6.75 to 7.00
Cast-iron carwheels	13.50 to 14.00

San Francisco

SAN FRANCISCO, CAL., May 27, 1913.

In some lines new business is coming out more freely than for some time, while in other departments buyers are holding off. The weakness of sheets has caused some uneasiness, but in other commodities prices are well maintained. The consuming demand continues active, the movement from store being as large as at any time this year, and general buying among merchants is expected as the present stocks become depleted. Building conditions are favorable, but some important business is held up by the difficulty of raising money for municipal and large corporation improvements. Merchants believe a reaction from the present period of activity and high prices is inevitable before the end of the year, but look for little change within the next three or four months.

Bars.—The bar situation in general is becoming a little easier, but not sufficiently to have a perceptible effect on prices. The consuming demand for soft steel bars keeps up well, and current specifications continue on about the same scale as for the last month, but deliveries are coming through in better shape. Supplies of reinforcing material are also increasing, some good-sized lots having come in by steamer, while the demand has lately been below expectations. Local mills are catching up with their orders and looking for new business and some pressure to sell is reported in Southern California. Soft steel bars from store, in small lots, are steadily held at 2.75c., and iron at 2.65c.

Structural Material.—Only one contract of special importance has been let recently, Dyer Bros., this city, having taken the Oakland Auditorium contract on a bid of \$177,000. A number of small jobs have been closed, however, both here and at Los Angeles, with a few others in country towns, and an unusually large tonnage is to be figured within the next few weeks. Bids for the auditorium to be built on the local civic center by the Exposition Company, requiring about 4000 tons, will be opened May 29, and bids on the local city hall steel are to be received June 11, though some delay may arise on the latter job owing to objections to the specifications by the Home Industry League. Aside from this, about the largest job now being figured is the Sather campanile at the University of California, requiring about 450 tons. The Pacific Rolling Mill has a small job on Geary street, near Larkin, and the Central Iron Works, this city, has a contract for the Gottschalk department store, Fresno, Cal. A local firm is also furnishing steel for the Hughson Hotel job, Modesto, Cal., and some work is coming up at Stockton. Bids will be taken July 5 for a 70-ft. searchlight tower for the Government in the Hawaiian Islands. Plans are under way for an 8-story class A hotel on Geary street, near

Mason. Deliveries of plain material are still improving, and fabrication on old contracts is progressing more rapidly than last month.

Rails.—Street railroad business is still coming out fairly well. The city of Los Angeles will take bids on a lot of switches, accessories and relaying rails on June 2, and for 750 tons of rails on June 23. The city of San Francisco has let contracts for extensions to the Geary street line, and is taking estimates on the cost of an extensive municipal system. There is a moderate but steady movement of light rails, some of which are coming in by sea, but standard sections are quiet in this vicinity. The smaller lines find it almost impossible to get money for extensions unless a large return is assured, and most plans for new lines are laid in abeyance. There is some business from logging roads, however, and considerable activity in this line is noted in the north.

Sheets.—Blue annealed sheets are still coming in rather slowly, and a good tonnage is being booked by mills that can make early delivery of blue annealed or hard red. The consuming demand is strong and a few firms have been rather short of stock, but many appear to have bought black and galvanized sheets in excess of requirements. The shading of prices on these has been followed by a sharp curtailment of specifications, and many buyers have requested the privilege of canceling their orders. This condition, however, is regarded as temporary.

Plates.—Tank and oil refinery construction still give rise to a fair volume of new business, and merchants are also keeping in the market to meet the liberal requirements of the distributive trade. To repair a wash-out in the Sand Canyon tunnel or the Los Angeles aqueduct, an emergency order amounting to \$18,300 was wired to the Riter-Conley Manufacturing Company, Pittsburgh, the material to be used for a 10-ft. siphon 2360 ft. long.

Merchant Pipe.—The advance just made by the National Tube Company was received with some surprise by the local trade. Stocks are rapidly decreasing under a heavy demand from the building trade, and while some merchants still have a considerable tonnage to come on old orders the majority expect to be well cleaned out by July 1. Firms that have bought nothing since the first of the year are coming into the market, and a renewed buying movement is expected soon, though merchants' specifications are not yet very large. Oil-well supply houses report sales ahead of last year, and there is still a heavy movement of light irrigation casing, hardly a firm in the State having a full stock in this line.

Cast Iron Pipe.—A fair tonnage has been placed recently and there are a number of new inquiries, though considerable business is delayed by the difficulty of disposing of bond issues for municipal or other improvements. The San Diego order for 4700 tons was placed with the United States Cast Iron Pipe & Foundry Company, which has also taken an order for Sacramento, Cal. Bids are now being taken for a lot of pipe for Colton, Cal., and the city of Pasadena is taking figures on 125 pieces of 4-in., 245 pieces of 8-in. and 100 pieces of 10-in. pipe. The town of Oxnard is taking bids on a complete water system, for which \$100,000 is available. Riverside also has voted a bond issue for waterworks. The city of Los Angeles will take bids June 3 for 5611 tons. The utilities committee of the San Francisco board of public works has recommended the purchase of 2750 tons of pipe to serve districts not included in the Spring Valley system.

Pig Iron.—Stocks in the hands of local melters are rather light, and a fair tonnage of Southern foundry and soft is being sold for prompt shipment, though under present conditions in the primary market individual purchases are small. About 400 tons of 4 to 5 per cent. silicon iron arrived recently from Europe, but the supply of Jarrow is about cleaned up, and values are nominal. No. 1 Southern foundry and soft are selling at about \$23, and No. 2 at \$22.25 to \$22.50. The Noble Electric Steel Company's plant has been in operation for several weeks, producing about 25 tons of pig iron daily, and is making arrangements to lease a railroad connecting its plant with the Southern Pacific.

Coke.—A modern tonnage of foreign coke has arrived by steamer, but was sold out prior to arrival and has had no perceptible effect on the market. Another shipment is due in about 40 days, and is quoted at \$14 per net ton, while the quotation on coke now loading for shipment by sailing vessel has dropped to \$12 per

gross ton, a fair amount of business being taken at this figure. Spot supplies are not heavy, and with a fair demand the price is firmly held at \$15 to \$15.50 per net ton. According to a recent Seattle report, a project for the establishment of a large coke plant in that vicinity is being undertaken by Henry M., Chas. G. and R. C. Dawes.

Old Material.—New offerings are still rather light, and the demand is keeping up, holding values in most lines fairly firm. The foundries are buying steadily, and little difficulty is experienced in disposing of cast iron scrap at \$18 per net ton, while steel melting scrap is a little more plentiful, and is quoted at \$12 per gross ton. Wrought scrap remains at \$13 to \$15 per net ton, and rerolling rails at \$17 per net ton, the demand for the latter showing little fluctuation. There is less demand for relaying rails than for some time.

Buffalo

BUFFALO, N. Y., June 3, 1913.

Pig Iron.—Some increase in inquiry is reported with an aggregate tonnage of 8000 to 10,000 tons foundry grades under negotiation for third quarter and last half. Sales have increased somewhat though totaling only about 5000 tons all told for the week. Some tonnage has been closed for foundry grades for the Brooks plant of the American Locomotive Works at Dunkirk. Interest among users appears to be growing and the outlook is a little more encouraging for producers than for some weeks past. There has been very little change in the price level, although it is understood some business offered at slightly lower figures has been considered. Average quotations are ruling about \$15 for No. 1 with some producers asking \$15.50 and higher and \$14.50 to \$14.75 for No. 2 X, with some furnaces holding for \$15 and over. One sale of No. 3 foundry is reported at \$14.25, although the ruling quotation for this grade is \$14.50. No sales of gray forge are reported and no price has been established for this grade for the week. The market is approximated as closely as possible by the schedule given below, which is for current quarter and last half, f.o.b. Buffalo:

No. 1 foundry	\$15.00 to \$15.50
No. 2 X foundry	14.75 to 15.00
No. 2 plain	14.50 to 14.75
No. 3 foundry	14.50
Malleable	15.25 to 16.00
Basic	16.00 to 16.50
Charcoal	16.50 to 17.50

Old Material.—The market exhibits rather less activity than reported a week ago with slightly lower prices for some commodities, railroad wrought having dropped 50c. per ton and old carwheels 25c. per ton. Most consumers are moderately well supplied and are holding off for still further reductions in prices; but the scrap yards show no inclination at this time to make other concessions than noted. We quote as follows per gross tons, f.o.b. Buffalo:

Heavy melting steel	\$11.50 to \$12.00
Boiler plate, sheared	13.50 to 14.50
No. 1 busheling scrap	10.50 to 11.00
No. 2 busheling scrap	8.00 to 8.50
Low phosphorus steel	17.00 to 17.50
Old iron rails	15.00 to 15.50
No. 1 railroad wrought	13.50 to 14.00
No. 1 railroad and machinery cast scrap	13.50 to 14.00
Old steel axles	17.50 to 18.00
Old iron axles	24.00 to 24.50
Old carwheels	14.25 to 14.75
Railroad malleable	12.50 to 12.75
Locomotive grate bars	10.00 to 10.50
Stove plate (net ton)	9.75 to 10.00
Wrought pipe	9.50 to 10.00
Wrought iron and soft steel turnings	6.00 to 6.50
Clean cast borings	7.50 to 8.00
Bundled tin scrap	16.00

Finished Iron and Steel.—Inquiries followed up show that they are based on actual requirements for current or immediate future consumption. The greater portion is evidently to cover requirements which have been supplied from warehouse stock in the past several months. Owing to the fact that steel now being shipped is used up just about as rapidly as it can be secured, selling agencies anticipate that a good buying movement is likely to develop in July or early August. If it were not for the strikes among machinists and other industrial workers, the jobbing business in bars, cold rolled shafting, sheets, etc., would undoubtedly have been beyond the jobbers' capacity to handle. Prices in all lines are fairly well maintained and oil line pipe has been advanced slightly, effective to-day. Inquiries are under negotiation in fabricated structural lines for 10,000 to 12,000 tons in the aggregate, one

involving 2000 tons and a few 400 and 500 tons each, including some railroad bridge work. Figures are being taken by the Niagara University, Niagara Falls, N. Y., for 150 tons for a new building, also for about 100 tons for a lion house for the Buffalo Zoological Gardens, and for a small tonnage for the State Fish Hatchery at Erie, Pa.

Morrison & Risman, Buffalo, dealers in scrap, are equipping their new classified storage yards on a five-acre site at Bailey avenue and the New York Central Railroad with shearing and punching machinery. A locomotive crane with lift magnets has been installed.

British Pig Iron Sharply Declines

Corner in Cleveland Iron Ended—Continental Material Half Demoralized

(By Cable)

LONDON, ENGLAND, June 4, 1913.

The squeeze is over in Cleveland warrants. They are now quoted at 58s. 9d., which is a decline of 12s. 9d. as compared with a week ago. Ore and coke are easier. Labor friction is developing. The general situation, therefore, is not liked. Continental material is half demoralized. The Standard Oil Company has bought more tin plates at 14s. 3d. for July shipment. Stocks of pig iron in Connal's stores are 241,455 tons against 240,301 tons last week. We quote as follows:

Cleveland pig-iron warrants (Tuesday), 58s. 9d., against 71s. 6d. a week ago.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 59s., against 70s. a week ago.

Ferromanganese, £11 12s. 3d., f.o.b. shipping port.

Steel sheet bars (Welsh) delivered at works in Swansea Valley, £5 5s.

German sheet bars, f.o.b. Antwerp, 92s. 6d., a decline of 2s. 6d.

German 2-in. billets, f.o.b. Antwerp, 90s., a decline of 2s.

German basic steel bars, f.o.b. Antwerp, £5 2s., a decline of 6s.

Steel bars, export, f.o.b. Clyde, £7 15s., a decline of 2s. 6d.

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £6 17s. 6d.

German joists, f.o.b. Antwerp, £5 12s. to £5 15s.

Steel ship plates, Scotch, delivered local yards, £8 7s. 6d.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 10s.

Steel rails, export, f.o.b. works port, £6 15s.

Tin plates, cokes, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 14s.

Buying Still Postponed, with Weakness in All Steel Lines—Shipyard Labor Restless

LONDON, May 24, 1913.

The dreary round of manipulation in the Cleveland warrant iron market seems to be at last reaching its end. The shorts have had a rough time of it for a fair amount of squaring off has been done at 70s. a ton, while even higher figures have been quoted on the open market, sellers now asking about 71s. Two brokerage firms threaten to appeal to the committee of the London Metal Exchange to declare that a corner has been created, but if they do they will probably get cold comfort, for the fact that there are quite a number of sellers shows that no actual corner exists. Part of the iron which has been coming out is from makers, who finding consumers in no hurry for deliveries have taken the occasion to profit themselves by putting iron into store. This has proved very annoying to the bulls.

In all genuine trade circles a depressed tone prevails, but it is possible that with the resumption of normal conditions in the warrant market quite a lot of buying may be done. The weakest spot is the Continent, where works are getting very hard up for orders and are pressing material for export at very low prices. Consumers, however, will not do anything more than is absolutely necessary to carry on their work and the result is that forward buying is at a standstill, and business is limited to the satisfaction of immediate needs only. Semi-finished steel is very flat. This week 4-in. billets have been sold by the Belgians and French at 87s. or so and 2-in. at a trifle over this figure. The Germans are not quoting, but will evidently have

to come down in their prices if they wish to make sales.

The tin plate trade is on a rather stronger footing now, the heavy American and Far Eastern buying having placed the largest makers in a pretty comfortable position for a couple of months or more. The prices accepted, however, were apparently profitless, but no doubt the sellers had the weak tendency of steel in their minds when booking the business. The galvanized sheet trade is now running into stormy waters. Here, as with tin plates, the capacity of production has been inordinately increased of late years, and now that demand has slackened there is a scramble for orders. Prices are 10s. a ton below the cost of production for some of the works, and under these circumstances mills are being laid off and some plants have shut down altogether for a period.

The steel trade is pretty busy on shipbuilding material, but a strong agitation is now on among the boiler makers employed in the shipyards with a view to securing increased pay, and the men seem disposed to enforce their claims by a national strike. If this came off it would finish things temporarily, as far as the iron and steel trades of this country are concerned.

Gloomy Outlook in Germany

Lower Prices Expected in All Finished Iron and Steel Lines

BERLIN, May 23, 1913.

The only reductions reported have been those of several dealers' organizations, made in compliance with the recommendation of the general organization, as mentioned in last week's letter. The feeling of producers about the price situation, however, is one of despondency, further reaction being regarded as probable. The downward movement in America, Belgium and other countries continues to attract much attention as symptomatic of general conditions in the world; and this is the main ground, apparently, for expecting lower prices in the German market.

Manufacturers Interviewed Are Not Hopeful

A newspaper correspondent who has just made inquiries among some of the leading manufacturers in the Rhenish-Westphalian district reports the following as the result of his questions: "The clearing up of the political situation has as yet had no noteworthy effect in promoting buying for remoter dates. Dealers particularly continue to show extreme reserve and even refuse to buy to any considerable extent at the heavily reduced prices now prevailing. There is considerable supplementary buying, however, for quick delivery; the prices paid on such orders are several marks above the average. Bars for delivery in the late summer and autumn have fallen to 110 marks. The export trade has also derived little benefit from the improvement in the political situation. In bars, however, inquiries are more numerous; but plates remain neglected despite the heavy reductions. Further reductions in finished products, both for home and foreign delivery, are regarded as probable in the near future."

The manager of one of the greatest mixed works in the western country, interviewed by the Cologne Gazette, says: "In bars and many lines of goods related to them there is almost no buying; new orders are extremely scarce. The same thing is true of plates and tubes. The uncertainty prevailing so long in the political world, the rumors of war, and the high price of money have had an uncommonly damaging effect and crushed all disposition to undertake new business. The prices for these goods have fallen heavily, as every manufacturer wants to get as large orders as possible. The mills are still fully employed on steel rails and all products used on railroads and there are big orders in hand for grooved rails, particularly from foreign countries, but in other respects the foreign market has grown very dull. On the other hand, the competition of the new works in Lorraine is making itself felt. The active sales of coal mean that there is as yet no shrinkage of production. In a few weeks, however, some concerns will probably have to begin to run on short time. There is no prospect of an improvement in the trade before autumn. The very short terms of delivery stipulated on recent orders show that supplies have nowhere accumulated, and the stocks of dealers are also exhausted. In spite of this, however, the latter are holding back with their orders, expecting to get still better prices later on."

The pig-iron situation remains as described in previous letters. The amount of orders in hand is satisfactory, nearly the full capacity of the furnaces for

the rest of the year having been booked. The big mixed establishments continue to consume, for the most part, all their own production and to demand additional quantities from the Pig Iron Syndicate.

The prolongation of the Wire Rod Association for one year is now reported as being as good as assured. On the other hand, the fate of the Tube Convention, which expires at the end of this month, is uncertain; its dissolution seems probable.

Germany Capturing Foreign Business

The newspapers are rejoicing this week over the fact that the Gutehoffnungs-Hütte received the contract for two pairs of lock gates and a rotating bridge for the East India Docks in London, in competition with English manufacturers. The German bid was £34,729, whereas the lowest British bid was £51,371.

It is reported that the German Steel Works Union has come to an arrangement with the steel organization of Italy, whereby the former is allowed to export 40,000 tons of steel yearly to Italy. This means the termination of a price war between the two organizations which was costly to the German Union. The price for shipments to Italy has been raised 25 marks a ton, and a further advance is looked for soon.

The Belgian market sends in news of more reductions than usual. At the end of last week a reduction in the home price of basic steel and iron bars of 2.50 francs was reported, and bands of the same figure. The following day came a reduction of 2s. in the export prices of steel and iron bars, and 3s. for thin sheets. Two days later came news that the furnaces had reduced foundry iron 2 francs, and other grades 3 francs. Finally, a Brussels dispatch yesterday reported another cut of 2.50 francs in the home price of steel and iron bars and 1s. in the export prices of billets and slabs.

New York

NEW YORK, June 4, 1913.

Pig Iron.—The principal transaction of interest in the Eastern market in the past week was the purchase of 5900 tons of foundry iron by the American Locomotive Company. Of this amount 3000 tons is for the Dunkirk, N. Y., plant, 1500 tons for Schenectady, 400 tons for Pittsburgh, and 1000 tons for Richmond, Va. It is believed the western New York iron was bought on a basis close to \$14, Buffalo, for 1.75 per cent. silicon. Some Buffalo sellers are adhering to \$14.50 for No. 2 X iron, while others, it would appear, are going below this price. Some inquiry has come up in the New York district, but one Eastern company which inquired recently for a round lot for the third quarter has withdrawn from the market for the time being. It cannot be said that buyers are much interested in contracting. Indeed, conditions in the past week seem to have made them less willing to take hold than was the case ten days ago. Stocks at furnaces have increased somewhat and some makers are considering the blowing out of part of their capacity. A purchase of about 10,000 tons of iron was made in the past week by a pipe foundry in Eastern Pennsylvania on the basis of about \$15.25, delivered, for No. 3, the freight from nearby furnaces being 35 cents. In Brooklyn there has been some agitation of an 8-hour day by molders at a number of foundries, but nothing definite has developed. As a rule iron is being melted by foundries in this district at substantially the same rate as for a number of weeks, but foundries do not see business ahead in the way they have grown accustomed to in the past year. On the whole their attitude is still one of hesitation. We quote Northern iron for tidewater delivery as follows: No. 1 foundry, \$16.75 to \$17; No. 2 X, \$16.25 to \$16.50; No. 2 plain, \$16 to \$16.25. Southern iron is quoted at \$16.50 to \$16.75 for No. 1 foundry and \$16.25 to \$16.50 for No. 2.

Structural Material.—With deliveries from a number of mills in five and six weeks and the general market 1.45c. Pittsburgh, it is not surprising that opinions are ventured that an attractive offering will bring less than 1.45c. Pittsburgh, for plain material. Mills which cannot make such early deliveries are still holding for 1.45c. Pittsburgh. Settlement of fabrication and erection work continues slow, and the week's awards for the relatively large projects in this territory do not total much over 5000 tons. It is estimated that in this section about 75,000 tons of fabrication work will be closed in the next six months, exclusive of subway work in New York City. While railroad inquiries have diminished considerably, it is not to be forgotten that business from this source

has formed a larger total of the work placed this year than has been the case for perhaps eight or nine years. The Philadelphia & Reading is inquiring for 1500 tons for track elevation in Philadelphia. The American Bridge Company has closed with the Norfolk & Western for 2800 to 2900 tons of bridge material; and the McClintic-Marshall Construction Company has taken 600 tons for a freight transfer at Manchester, N. Y., for the Lehigh Valley and 200 tons for two bridges for the Pennsylvania Railroad. Other contracts include 900 tons for the Yale & Towne Mfg. Company's brass foundry at Stamford, Conn., given to the Belmont Iron Works; Y. M. C. A. building, Watertown, N. Y., 450 tons, to the Massey Machine Company; 300 tons for a paper mill in West Virginia to the Jones & Laughlin Steel Company. Mill shipments are obtainable in five to six weeks at 1.45c., Pittsburgh, and 2.15c. from store.

Plates.—Deliveries from eastern Pennsylvania mills are easier, but new demand from this territory is quite dull. A large tonnage for last half for a manufacturing interest has, it is understood, been closed at 1.56c. delivered at seaboard. There has been no car buying of moment, but the Southern Railroad, which is regarded as a likely purchaser of over 4000 cars, has placed a definite inquiry for early settlement for 400 steel hopper cars and the Bethlehem Steel Company is in the market for 65 coke and 25 flat cars and the Atlantic Coast Line for 100 flat cars. Car builders are still experiencing delays in the delivery of specialties. We quote 1.61c., New York, for mill shipments in the last half, and 1.76c., New York, for delivery in two weeks or even earlier.

Bars.—Some cancellations have occurred, buyers aiming apparently to relieve themselves of future commitments, probably under the belief that present prices and good deliveries can later be obtained. Considerable credence is given in railroad circles to favorable action of the Interstate Commerce Commission to the proposed horizontal advance in railroad freight rates, and this, together with favorable crop reports, is expected soon to manifest itself in renewed buying. The fact remains that premiums are absent and recent requirements for early deliveries of small bars have been taken care of. In bar iron there is still a wide variation between highest and lowest prices being quoted, but new business is not large in volume, though specifications on contracts are keeping up remarkably well from the railroads and locomotive builders. Railroad spikes are obtainable in a few weeks but track bolts and machine bolts are easier with some mills than with others. No prices for bar iron less than 1.50c. at mill have been noted. We quote bar iron at 1.60c., New York, and steel bars at 1.56c., New York, deliveries depending on the mill. Store prices are 2.05c. for steel bars and 2.10c. for iron bars.

Old Material.—The most important transactions of the week were sales of small lots of heavy melting steel scrap for eastern Pennsylvania at \$11.50 to \$12 delivered. Consumers of scrap show little interest in the market, as inquiries are lacking. Railroad lists out this month are large, both the Pennsylvania and the Baltimore & Ohio offering considerably greater quantities than in recent months. With the increased supply coming on the market and the indifference of consumers, the prospect for improvement in prices is dark. Quotations are as follows, per gross ton, New York, the inside figures representing prices offered by dealers:

Old girder and T rails for melting.....	\$9.00 to	\$9.50
Heavy melting steel scrap.....	9.00 to	9.50
Relaying rails.....	22.00 to	22.50
Rerolling rails.....	12.50 to	13.00
Iron car axles.....	22.50 to	23.00
Steel car axles.....	14.50 to	15.00
No. 1 railroad wrought.....	12.00 to	12.50
Wrought iron track scrap.....	11.50 to	12.00
No. 1 yard wrought, long.....	11.25 to	11.75
No. 1 yard wrought, short.....	10.25 to	10.75
Light iron.....	4.00 to	4.50
Cast borings.....	6.00 to	6.50
Wrought turnings.....	6.00 to	6.50
Wrought pipe.....	9.25 to	9.75
Car wheels.....	12.00 to	12.50
No. 1 heavy cast, broken up.....	10.50 to	11.00
Stove plate.....	8.75 to	9.25
Locomotive grate bars.....	7.50 to	8.00
Malleable cast.....	9.50 to	10.00

Cast Iron Pipe.—The city of Schenectady, N. Y., which had advertised the opening of bids May 28 on 1500 tons of 24 in., postponed the opening until Tuesday of this week. No other public lettings of importance are announced in this vicinity, but the general demand from all sorts of private sources has increased remarkably, being much heavier than for some months. Makers of pipe are, therefore, greatly encouraged. Inquiries are in hand for one lot of 4000 tons for Cuba, another of 3000 tons for Cuba and one of 2500 tons for

Porto Rico. The inquiry for 100,000 tons for Buenos Ayres, Argentina, is up again, but the question has not been definitely decided as to whether this pipe shall be furnished in steel or cast iron. Carload lots of 6 in. are quoted at \$23 to \$24 per net ton, tidewater, New York, with some makers asking a higher price.

Ferroalloys.—Inquiries for 80 per cent. ferromanganese are so light that the market is not being fully tested. Producers' agents continue to quote \$61, Baltimore, but resale lots at concessions are still coming to the surface. The market for 50 per cent. ferrosilicon is quiet also at \$75 for carloads, \$74 for 100 tons and \$73 for 600 tons and over.

Metal Market

NEW YORK, June 4, 1913.

The Week's Prices

Cents Per Pound for Early Delivery.							
Copper, New York.		Lead—		Spelter—			
		Electro-	Tin,	New	St.	New	St.
May	Lake.	lytic.	New York.	York.	Louis.	York.	Louis.
29.....	15.75	15.50	47.00	4.35	4.20	5.35	5.20
31.....	15.75	15.50	.....	4.35	4.20	5.35	5.20
June							
2.....	15.75	15.25	46.60	4.35	4.20	5.30	5.15
3.....	15.75	15.25	46.50	4.35	4.20	5.30	5.15
4.....	15.75	15.25	46.60	4.35	4.20	5.30	5.15

Consumers are not buying copper, despite concessions offered in electrolytic. Tin, after heavy sales, declined. Lead is quiet, but fairly steady. Spelter continues dull and is lower. Antimony is unchanged.

New York

Copper.—In the almost complete absence of demand the market in electrolytic is being made by offerings of resale lots at 15.25c., cash, New York. The supply at this price is not large. The producers are declared to be holding to their figures of 15.75c., cash, New York, for electrolytic and 15.87½c. to 16c. for Lake, though it is understood that they have little of the latter to sell for deliveries this side of August. Most consumers are supplied with June electrolytic. All prices are nominal. It is daily becoming more freely admitted that consuming mills are receiving fewer orders for their products, though they are busy on old ones. Since the last report spot copper has declined £1 10s. in London and futures £1 7s. 6d. Spot copper is quoted in London this morning at £66 17s. 6d. and futures at £66 15s. Exports this month total 495 tons.

Copper Averages.—The Waterbury average for May was 15.87½c. The average New York price for Lake, based on the daily quotations in *The Iron Age*, was 15.91c. and for electrolytic, 15.64c.

Pig Tin.—The feature in this market was the large and active buying which occurred Thursday afternoon when, according to various estimates, not less than 500 tons and perhaps as much as 1000 tons was bought, mostly for future delivery and by many and scattered purchasers. The tin disposed of was mostly on account of one house which is supposed to have been acting for London clients who were desirous of unloading. London did not advance in response to the heavy selling here, which ordinarily would have happened, and this is credited to selling abroad by the same interest. On Monday and Tuesday from 100 to 200 tons was sold each day. Since May 29 the market has declined to 46.50c. and its course has been extremely disappointing to the buyers of last week in view of the higher prices they paid. The quotation in New York this morning was 46.60c. In London it was £212 5s. for spot and £211 5s. for futures. The arrivals this month total 350 tons and there is afloat 2150 tons.

Lead.—The demand has almost entirely subsided but the metal remains fairly firm at 4.35c., New York, and 4.20c., St. Louis. While some interests are asking a few points more in St. Louis, 4.20c. probably is the maximum price that could be obtained at this time.

Spelter.—This metal continues quiet and the price has further declined. Quotations are 5.30c. to 5.35c., New York, and 5.15c. to 5.20c., St. Louis. One reason for the lessened demand is a falling off in the requirements of galvanizers.

Antimony.—The market continues dull and otherwise without change, with prices nominal at 8.70c. for Cookson's, 8.20c. for Hallett's and 7.50c. for Chinese and Hungarian grades.

Old Metals.—The market continues dull. Dealers' selling prices are nominally unchanged, as follows:

	Cents per lb.
Copper, heavy and crucible	15.00 to 15.25
Copper, heavy and wire	14.75 to 15.00
Copper, light and bottoms	13.00 to 13.25
Brass, heavy	9.50 to 9.75
Brass, light	8.25 to 8.50
Heavy machine composition	13.75 to 14.00
Clean brass turnings	8.75 to 9.00
Composition turnings	11.50 to 12.50
Lead, heavy	4.25
Lead, tea	4.00
Zinc, scrap	4.25

Chicago

JUNE 2.—Trading in metals has been dull. The only change in prices has been the decided slump in tin. Old metal prices show slightly higher levels. We quote as follows: Casting copper, 15.75c.; Lake, 16c. to 16.25c. in carloads for prompt shipment; small lots, ¼c. to ½c. higher; pig tin, carloads, 48c., small lots, 50c.; lead, desilverized, 4.35c. to 4.40c.; corroding, 4.60c. to 4.65c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5.35c. to 5.40c.; Cookson's antimony, 10.50c., and other grades, 9.75c., in small lots; sheet zinc is \$7.50 f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots: Copper wire, crucible shapes, 14c.; copper bottoms, 13c.; copper clips, 13.75c.; red brass, 13c.; yellow brass, 9.75c.; lead pipe, 3.00c.; zinc, 4.35c.; pewter, No. 1, 33c.; tin foil, 40c.; block tin pipe, 44c.

St. Louis

JUNE 2.—Little of special interest has occurred and prices have fluctuated only slightly. Lead closed at 4.20c.; spelter, 5.15c. to 5.17½c.; tin, 47.45c. to 47.85c.; Lake copper, 16.35c.; electrolytic copper, 16.15c. to 16.25c.; antimony, Cookson's, 9.10c. to 9.35c. In the Joplin ore market all grades of zinc and sulphide ores were lower and the demand was much lighter than for some time. A decline of as much as \$3 per ton was to be noted in second-grade ores, while for the choicer lots the decline was 50c. to \$1. The best basis settlement reported was \$45 for 60 per cent., this being paid only for the second grades and meaning a settlement \$8 to \$10 per ton lower. The choice ores brought a basis of \$42 to \$44, with \$47 paid for those carrying 63 per cent. Calamine sold for \$20 to \$21 for 40 per cent., while choicer grades brought up to \$25. Lead ore was unchanged at \$52.50. On miscellaneous scrap metals we quote as follows: Light brass, 6c.; heavy brass and light copper, 9.50c.; heavy copper and copper wire, 11c.; pewter, 25c.; tin foil, 34c.; zinc, 3.50c.; lead, 3.50c.; tea lead, 3c.

Iron and Industrial Stocks

NEW YORK, June 4, 1913.

The market has given way under depressing influences, both foreign and domestic, and stock prices have struck lower levels. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week has been as follows:

Am. Can. com.....	30½-33½	Pressed Steel, com...	22½-23½
Am. Can. pref.....	90-92¾	Railway Spring, com.	26-27
Am. Car & Fdy., com.	45½-48½	Republic, com.....	20½-23
Am. Car & Fdy., pref.	112-112½	Republic, pref.....	81½-82¼
Am. Loco., com.....	31¼-32¾	Rumely Co., com....	23¼-25¼
Am. Loco., pref.....	102-102½	Rumely Co., pref....	48½-50
Am. Steel Foundries...	30	Sloss, com.....	29
Bald. Loco., com.....	45	Pipe, com.....	10½-12
Beth. Steel, com....	31¼-32½	Pipe, pref.....	47
Beth. Steel, pref....	69-69¾	U. S. Steel, com....	57½-60¾
Colorado Fuel	28-31¼	U. S. Steel, pref....	105-106¾
Deere & Co., pref....	97-97¾	Va. I. C. & Coke....	38-40
Emer-Brant, com....	25-29	Westinghouse Elec...	60-61¾
General Electric.....	135½-139	Am. Ship, com.....	52
Gr. N. Ore Cert....	31½-33¼	Am. Ship, pref....	98-100
Int. Harv., new, pref...	111½	Chic. Pneu. Tool....	49¾
Int. Harv. Corp.....	103	Cambria Steel.....	45-47½
Int. Harv. Corp., pref...	113	Pa. Steel, pref....	60-64
Int. Pump, com....	7½-9	Warwick	10½
Int. Pump, pref....	30	Crucible Steel, com.	13¼-14
Lackawanna Steel....	33	Crucible Steel, pref.	87½-88
Nat. En. & St., com.	9¾-14½	Harb. Walk Ref., com...	45¼
Nat. En. & St., pref....	75	Harb. Walk Ref., pref...	102
Pittsburgh Steel, pref...	98½	La Belle Iron, com....	42

Dividends Declared

La Belle Iron Works, regular quarterly, 2 per cent. on the preferred stock, payable June 30, and ½ of 1 per cent. on the common, payable July 31.

The Republic Iron & Steel Company, regular quarterly, 1¼ per cent., on the preferred stock, payable July 1.

Personal

The Board of Governors of the New York Machinery Club, June 2, elected the following officers for the coming year: President, W. L. Saunders, Ingersoll-Rand Company; vice-president, Charles A. Schieren, Jr., Charles A. Schieren Company; treasurer, Edwin H. Benners, Crown Castings Company; secretary, Frederic Stadelman, Wellman-Seaver-Morgan Company.

Col. Charles M. Jarvis, who has been quite seriously ill for some weeks, has tendered his resignation as president of the American Hardware Corporation, New Britain, Conn. It is stated that an announcement concerning his successor will be made within a few days.

John F. Nisbet, advertising manager of the Triumph Electric & Ice Machine Company, Oakley-Cincinnati, Ohio, has severed his connection with that company to accept an appointment in London, England.

John O. Pew, vice-president and general manager of the Youngstown Iron & Steel Company, Youngstown, Ohio, who has been seriously ill, is recovering.

William Lodge, president Lodge & Shipley Machine Tool Company, Cincinnati, Ohio, expects to sail for Europe, on a vacation trip, some time in June.

H. S. Johnson, vice-president Gisholt Machine Company, Madison, Wis., returned from Europe May 31.

W. O. Duntley, president Chicago Pneumatic Tool Company, Chicago, returned from Europe June 4.

The New Jersey Zinc Company, 55 Wall street, New York, announces the following changes in its organization: Herbert G. Clopper, formerly general purchasing agent, becomes general sales manager; Alfred W. Dodd, Eastern sales agent; Walter D. Main, Western sales agent; E. V. Peters, acting general purchasing agent.

John F. Jackson, vice-president Wisconsin Bridge & Iron Company, Milwaukee, will design the ore dock and transportation facilities for the Bethlehem Steel Company in Chile. He left last week for South America. He was selected for this position by reason of his achievement in designing docks on Lake Superior. He expects to be absent from Milwaukee for three months.

Maximilian Toch, New York, sailed for Europe last week. He will deliver an address before the Paint and Varnish Society of London and will attend the annual meeting in July of the Society of Chemical Industry, of which he is the American vice-president.

Dr. Paul Heroult has returned from France for a visit in the United States.

R. K. LeBlond, president R. K. LeBlond Machine Tool Company, Cincinnati, Ohio, sails on a business trip to Europe June 4.

George W. Hannan, formerly general manager of the tin plate plants of the Phillips Sheet & Tin Plate Company, has been made general manager of the works of the Washington Tin Plate Company, Washington, Pa.

John S. Albert, of the engineering department of the Southwark Foundry & Machine Company, Philadelphia, Pa., has been appointed its Pittsburgh representative, with offices in the Frick Building. He succeeds Karl Nibecker, who resigned to take the position of steam engineer with the Youngstown Sheet & Tube Company.

Austin H. Hart, manager of the American Rotary Valve Company, Anderson, Ind., has resigned to become president of the Waco & Nashville Railroad Company, with offices at Washington, D. C. He is succeeded at Anderson by A. W. Wicks of Chicago.

Edward Montanus, Springfield Machine Tool Company, Springfield, Ohio, sailed May 29 for a three months' business trip to Europe.

J. D. W. Snowden has been appointed assistant district sales manager of the Cleveland office of the Cambria Steel Company.

Philip Fosdick, president Cincinnati Gear Company, Cincinnati, Ohio, will leave this week on a business trip to Europe.

H. Lee Moore, resident engineer, Buffalo Forge Company, Cincinnati, Ohio, has been transferred to Pittsburgh, and will have entire charge of the latter office.

T. H. Powning, who has been traveling representative of the Pittsburgh Steel Company, with headquarters at

Cedar Rapids, Iowa, has become Southern representative of the Youngstown Sheet & Tube Company in its wire fence department, with his headquarters at Louisville, Ky.

Obituary

HAMMOND DIETRICH, senior partner of Dietrich Bros., Baltimore, Md., died in that city May 30, after several weeks' illness with intestinal trouble, aged 54 years. He was truly a self-made man. Educated in the public schools of Baltimore, he showed at an early age business ability and a capacity for leadership. When only 19, he, with his brother Andrew, established the structural iron and steel concern which has grown to splendid proportions. Socially Mr. Dietrich was as prominent as in a business way. He was always an enthusiastic supporter of any plan which would benefit Baltimore, and was a member of numerous fraternal bodies. He leaves a widow and a son.

BERNARD SCHUCHARDT, of the German machine tool house of Schuchardt & Schutte, died June 2 in Berlin after a short illness. The firm has a New York office at 90 West street.

Blast Furnace Notes

The Empire Steel & Iron Company is dismantling its two Henry Clay furnaces at Reading, Pa.

The Keystone furnace of the Reading Iron Company, Reading, Pa., which has been out of blast for some months for extensive improvements, will be blown in shortly.

The Thomas Iron Company now has three furnaces in blast, one Hokendauqua, Pa., furnace having been blown out in May.

The Tuscaloosa furnace of the Central Iron & Coal Company at Holt, Ala., made 8290 tons of pig iron in May, this being much the largest month's output for this furnace.

The Illinois Steel Company blew out one South Chicago furnace in May. One of the stacks at Gary, Ind., was also blown out.

In the Pittsburgh district two furnaces were blown out in May—one Edgar Thomson and one Eliza. Two were blown in in the month, one Carrie and one Shoenberger.

The Pennsylvania Steel Company blew out one of its Lebanon, Pa., furnaces in May and on May 26 banked its Lochiel furnace.

A Heavy Immigration Movement

As bearing on the question of labor supply in the iron, coke and other industries the statistics of recent arrivals of immigrants at Ellis Island are interesting. It is estimated that fully 30,000 immigrants will be landed at Ellis Island this week, 30 steamers bringing an average of about 1000 each. June is expected to give a total of 100,000 arrivals. In May the number was about 100,000, in April 105,000 and in March 73,000. In the year ending June 30, 1912, the number of immigrants arriving at all ports was 838,172. In the nine months ending March 31, 1913, the number was 747,998. Many of the aliens arriving in recent months are from Italy and Greece.

The Pratt-Gilbert Company, Phoenix, Ariz., dealer in heavy hardware, farm implements, machinery, wagons, etc., has acquired an entire block on the principal street of the city, having a frontage of 300 ft. and a depth of 100 ft. It will at once build on half the site, using the other half temporarily for warehouse purposes. The company desires to be put in communication with those who furnish stock equipment suitable for hardware, implement, vehicle and machinery houses.

Labor unrest throughout England is becoming acute. Leaders of various unions are denouncing the government for not passing a minimum wage bill affecting all industries, and a national walkout may be the outcome. Between 30,000 and 40,000 workmen are now idle. Representatives of shipyard workers are meeting and a strike may be ordered involving many thousands of work people. At Dudley 2000 men and women brickmakers gave notice of a strike on Monday.

Judge Gary Testifies for the Corporation

(Continued from page 1373)

small; the facilities for furnishing steel were not sufficiently diversified. We lacked finishing mills, and our locations were not the best nor good enough to extend foreign trade, as we had hoped. In fact, the Federal Steel Company was only the beginning of a plan for organization to carry into practical and successful effect what we had in mind, and what we were endeavoring to accomplish.

We attempted to secure additional capital for the purpose of building and completing finishing plants. We got up a plan of raising money by voluntary subscription of those interested. We did not succeed very well. We endeavored to form a syndicate in order to raise money and a few of us placed our names on paper for that purpose, but, although I had several conversations with Mr. Morgan on the subject, he did not seem to be willing, or at least did not take the matter up. A mortgage of \$45,000,000 upon the plants of the company was drawn up to protect the subscribers. The plan, however, was never carried out and the mortgage never executed. This was in the latter part of 1900. This mortgage plan was interrupted by other opportunities.

The Purchase of the Carnegie Company Looms Up

In 1899, I think it was, Henry C. Frick had come to my office and suggested that the Federal Steel Company purchase the Carnegie Steel Company and merge with it several other companies; for example, the wire and tin plate companies.

Mr. Frick gave Judge Gary an estimate as to what he could get the Carnegie properties for. Judge Gary was impressed and talked with Mr. Porter and Mr. Rogers, who in turn met Mr. Frick. Mr. Rogers insisted that the organization of the Carnegie Steel Company remain with the company in case the Federal took it over, and to this Mr. Frick would not consent. The negotiations were dropped. They told Mr. Frick that they did not consider the Carnegie properties anything like as valuable without the organization as they would be with it. The next thing that Judge Gary knew of the Carnegie plan of selling was about the option given to the Moore Bros., which also fell through. He continued:

Early in 1900 Mr. Schwab came to me and told me that we ought to take over the Carnegie properties. He said they could be bought. I went to see Mr. Morgan about it, although I never reported to Mr. Schwab that I did see Mr. Morgan. This purchase would involve the raising of a good deal of cash, and Mr. Morgan was not inclined to take it up.

Within a couple of months Mr. Schwab again approached me and repeated his suggestion. My executive committee knew of all these negotiations. They ran along parallel with the attempt to better finance the company. The next thing I heard was the dinner which Mr. Simmons and, I think, Charles Emery Smith gave to Mr. Schwab. I was not present and only knew of what took place from what Mr. Morgan told me afterward.

Mr. Morgan Impressed by Mr. Schwab's Speech

The dinner was on December 12, 1900. Mr. Bacon came to my apartment in January, 1901, and told of the negotiation of Mr. Carnegie and Mr. Schwab with Mr. Morgan. Mr. Bacon said Mr. Morgan was desirous of having my opinion in regard to the purchase of this property, and also anxious to know what it was as a business proposition; that Mr. Morgan had been much impressed by a speech Mr. Schwab had made at the dinner.

I found Mr. Morgan the next day at his bank. He said that if it was deemed a good business proposition we should consider the advisability of trying to form a syndicate to finance it; but that he would first like to go over it with me, and would like to hear any suggestions. I went over the matter with him and let him see that it would be a good business proposition, providing we could, at the same time, secure other properties that were finishing steel; and also that it might be good practice anyhow. I told him that, until I had an opportunity of consulting with the leading interests in the Federal Steel Company, I was not prepared to give any decision as to what would be our attitude, although I had given him my personal opinion. I told him I would get together those that were considered the leading men in the Federal Company. He said, "All right," and I immediately began to assemble them.

Judge Gary then got together Messrs. Porter, Rogers, Mills, Thayer, and Ream, who happened to be in New York that morning, and talked over the long distance tele-

phone with Marshall Field in Chicago, who said he would abide by the decision of the others. The meeting was held in one of Mr. Morgan's rooms. Judge Gary said:

There was some opposition to the purchase of the Carnegie property, I remember. The price was named, according to my recollection, but before we finished the discussion it was unanimously agreed that we would purchase the property if we could finance it. It was a financial proposition. H. H. Porter was the last man among the directors to approve of the scheme.

Reasons for Taking Over the Carnegie Company

Judge Gary stated in general the reasons why it seemed advisable to take over the Carnegie Company. Among these was its large finishing capacity and the fact that the purchase of the company would open the East to the Federal. The Illinois Steel Company could not successfully compete with the Carnegie Company more than 100 miles east of Chicago, if it could at that distance. He added:

Of course, any manufacturer can send his goods into any other location. There is legitimate and reasonable competition, and there is other competition that is simply foolish and nonsensical. I would distinguish between the two.

Q. Now, then, with regard to other properties that you talked about. You said you knew the wire mills were for sale, and discussed the matter of acquiring them in case you decided to take up the suggested scheme as a feasible business proposition. A. Yes.

Judge Gary told of his call upon D. G. Reid, his talk with him and with W. H. Moore regarding the purchase of the so-called Moore properties, which included the Tin Plate, Steel Sheet, National Steel and National Steel Hoop companies. The National Steel Company produced semi-finished steel, most of it sold to the other three Moore properties. Judge Gary took Mr. Reid over to Mr. Morgan to introduce him.

Judge Gary said he wished to state further about what occurred at the meeting in Mr. Morgan's offices, at which the leading interests of the Federal Company were in attendance. He showed here, as he did all through his testimony, care in mentioning Mr. Morgan's connection:

I sent a request to Mr. Morgan to come into the same room or in some way secured his presence. Mr. Morgan said it would be a big undertaking, but if these gentlemen, who were practical and directly connected with the business, were satisfied this was a good business proposition and could be made successful, he would undertake to form a syndicate to furnish the necessary financial support.

The next thing was the calling in to the consultation of eminent lawyers. Victor Morawetz and Francis Lynde Stetson were requested to come to the bank, and from that time on until the organization was complete I think I spent the forenoon of nearly every business day at the banking house of J. P. Morgan & Co., and sometimes a larger part of the day, but generally in the afternoon, at the offices of the lawyers.

The Prominent Part Taken by Judge Gary

Soon after it was decided to purchase the Carnegie properties, and following that the formal agreement for their acquisition was drawn up, Mr. Stetson representing the Federal Steel Company and Judge Reed representing Mr. Carnegie. After that we began negotiation for the acquisition of the different properties.

Q. By whom were these negotiations carried on, on behalf of your company, and what, if anything, did you personally have to do with that? A. I had considerable to do with them. Mr. Bacon had something to do with them. I did particularly with the Wire Company, I remember. Some of the others at the bank had attempted to negotiate with the Wire Company, and had got to the point where they seemed to think they could not succeed. I took it up and finally made a bargain with the company. This was at Mr. Morgan's bank.

Q. Was that negotiation rather prolonged? A. It was.

Mr. Lindabury then called attention to the circular letter dated March 2, 1901, signed by J. P. Morgan & Co., and addressed to the stockholders of the Federal, National and the other companies that were requested to join in the forming of the new corporation on a stated basis of security exchange. As to the form of the new corporation, Judge Gary said:

My first suggestion was to increase the capital stock of the Federal Steel. My next suggestion, when it was determined under the advice of counsel to organize a new corporation, was to call it the Federal Steel Company. I

rather wanted to keep the name, but it was finally decided to call it the United States Steel Corporation.

Q. How did you arrive at the capitalization of the new corporation? A. We added together the cost of each of the subsidiaries to be taken in, and allowed a margin with which to purchase other properties which we then contemplated getting at a later date, if we could—properties that had been agreed upon by the principal stockholders.

Why Several Companies Named Were Taken Over

Judge Gary told of the difficulty in taking over the Moore properties. He said:

They would not sell one without all, as I remember. We could not have taken the other three companies unless we took the National Steel; but it was a very good purchase in connection with them, as the National Steel Company's properties were needed to supply steel to the other three companies connected with the "Moore group." The other reason was that the National Steel had some very good ore property, and also I am very certain that Mr. Carnegie insisted that the National Steel should be purchased so that he would have security on the property of the National Steel for his bonds.

Judge Gary told about Mr. Morgan's asking him to make an estimate on the value of the Rockefeller ores, and of his later showing memorandum which Mr. Frick had brought him, coming direct from the Rockefellers. The offer obtained by Mr. Frick was accepted. He continued:

The reason we bought the Rockefeller ores was because such a large steel manufacturing company as we were organizing needed large deposits of ore. I knew from my own general knowledge and from my connection with the business that it was essential that we have a supply of ore as large as we would have with the Rockefeller ores included, and larger for that matter. The Federal Steel had not bought very much, because we did not have the money; that is the truth about it. My associates agreed with me in regard to this.

Judge Gary told about taking over the American Bridge Company after the other subsidiaries had been taken into the corporation. He spoke about Percival Roberts, Jr., who was the president of the American Bridge Company, saying:

He had previously been a dominant factor in the Penney Works, and was a man of large experience, and I would say of great ability, if he were not in the room. The Bridge Company added to our finishing capacity. By taking it over we secured a company that was buying steel of the other subsidiaries already taken in and would secure plants located near the seaboard—plants we could utilize

particularly for the export trade. Our plan was to acquire properties that would be useful to each other; to acquire plants which manufactured some form of steel that other subsidiaries could make into a finished product, and so all through the line, from the ore down to the final distribution of the finished product.

Judge Gary was asked if the matter of the proposed Carnegie tube works at Conneaut, Ohio, was talked of when the Carnegie Steel Company was taken over by the Steel Corporation. He replied that it was not mentioned in any connection by anybody.

He said that the companies taken together, according to his judgment at that time and at the present time, were worth to the corporation the price that it paid for them in its start. He said that the prices of the subsidiary companies when taken over by the corporation were made as low as possible by the organizers.

Taking of Competing Companies Was Incidental

Q. In so far as any of these companies were duplications, was that purely incidental, or with a purpose? A. It was incidental. I say conscientiously there was no effort or disposition on our part to secure a monopoly or to restrain trade. Our intention and our efforts were and have been to extend trade and to force competition; and we have done that.

Judge Gary told of the Illinois Steel Company and the Carnegie Steel Company both manufacturing rails, and that the Carnegie Company did at times sell rails in small quantities in the Chicago district at a price lower than the Illinois Company could make those rails for if proper charges and proper accounting were made. He added:

The Carnegie Company could do what it came very near doing at one time, namely, force the Illinois Steel Company into the hands of a receiver. In 1896, if I am not mistaken, the Illinois Steel Company came very near going into the hands of a receiver. The papers were drawn, in fact.

Judge Gary said that no attempt was made to take over any of the other steel companies, such as the Lackawanna, Republic, etc. He stated that the percentage of the Illinois Steel Company's trade west of the Indiana and Ohio line was from 95 per cent. upward. He said that the Bessemer & Lake Erie Railroad enabled the Carnegie Company to sell some products in the Northwest when lake navigation was open and it could sell down in the Southwest when the water in the rivers was very high, but that its market largely was east of Ohio and Indiana, certainly east of Illinois.

The General Policy of the Steel Corporation

Much of the testimony of Judge Gary on Thursday related to the policy of the corporation. It was preceded by a short inquiry in regard to securing competing plants. Judge Gary said:

The Carnegie Company was prepared to make, and was making, a very large quantity of open hearth steel, which was coming more and more into use. The Illinois Steel Company made little open hearth steel, comparatively speaking. The railroads were beginning to demand open hearth steel for rails, and it was being demanded for other uses. The Illinois Steel Company did not have the money to extend its open hearth steel capacity, as it needed to do.

At the time of the organization of the Steel Corporation, said Judge Gary, the American Sheet Steel Company, the American Steel Hoop Company, the American Tin Plate Company and the National Tube Company were not in competition with any of the other companies to any considerable extent. The Carnegie Steel Company, however, had some competition with the National Steel Company, but this was very small, as the latter company sold about 90 per cent. of its bar production to the other companies in the "Moore group." The National Company had a rail mill, and it was a mill on which it could roll other products. In one year, perhaps, it might make a good many rails, but it was because the market for bars happened to be poor.

The High Standing of Mr. Morgan Helped the Merger

Taking up again the negotiations during the organization of the Steel Corporation Mr. Lindabury asked:

Q. Did the firm of J. P. Morgan & Co. act, in the matter of organizing the United States Steel Corporation, or assume to act in any other capacity than as financiers? A. They were the financiers. As far as the business questions were concerned, they did not assume to act. Of course, the organization of the United States Steel Corporation was not possible except for the strength and influence of J. Pierpont Morgan; first, because it was necessary to have a financial concern of his strength, and there was no other that was comparable to Mr. Morgan in that regard; and, second, because the men connected with the various subsidiary corporations, as they afterward became, had confidence in J. P. Morgan and his firm, and anything that he would finance or anything that he would become connected with or stand for made it certain that immediately the general public, including these gentlemen connected with the company that I have referred to, would have confidence and did have confidence in the general enterprise.

J. P. Morgan & Co. had the right to determine how many members should be on the board of directors, what character of committee should be formed at the outset, and things like that, and they did act in that capacity, but never without first consulting the Federal Steel interests did they decide upon any plan as to the number of directors, as to who should go on the board of directors, as to the kind and character of the executive committee, who should go on the committee, etc.

Q. What policy, if any policy in particular, has the corporation pursued since its organization with regard to the sale of its products, as to prices and the treatment of its purchasers?

The Corporation and the Stability of Business

A. The Steel Corporation has always favored stability of business and opposed demoralization of trade as far as it could legitimately do so. An effort has been made to sell at lower prices as far as it could and to reduce its price if and when it could, and ought to do so, to a point where it was believed that prices were reasonable, and so considered by the consumers. The corporation, as far as it could, has endeavored to prevent fluctuations downward by its advice, but more particularly by its own action in fixing its prices.

It has endeavored to prevent an unreasonable increase in prices at times when the demand was greater than the supply, and there was a general disposition in the trade to take advantage of those conditions. This was done, first, because it is in the interest of the employees of the company, and secured because it is in the interest and is the wish of the customers of the company. The steadiness of business which keeps the mills in operation affords an opportunity for a continuous employment of the laboring man and at fair and reasonable living wages, and in no other way can that be done, and never has been done.

Mr. Colton: I should like to enter an objection to that as purely argumentative and as a mere statement of opinion.

Judge Gary: I did not mean to state that as an opinion; I meant to state it as a fact.

Q. How, in practice, have you found that theory to work? A. It has enabled us to keep our mills running at times when otherwise we could not have kept them running, but more particularly it has enabled us to maintain our wages and to advance them from time to time. I may be mistaken, but I think that only once since the corporation was organized have we reduced wages. This was following the great depression of 1904.

Q. Did you get through the panic of 1907 without having to reduce wages? A. We did, although our competitors decreased theirs. If you will excuse me, I will say we have never had stable prices. There is not any such thing as stable prices in the business and never has been; it has never been possible. Of course, there may be some exceptions to that general rule at times, and depending upon conditions and depending upon the things sold and to whom sold and the lowness of the price. You can maintain a very low price, but the stability of prices in the business is not a fact, and I would distinguish between that and stability of the business. I do not want to be put in the position of admitting that I never stood for the maintenance of what I call "stability of prices." I do not want our corporation put in a false position.

When Stability of Prices Helps the Purchaser

Judge Gary told of the troubles of the ordinary purchaser of steel commodities, who has on hand large stocks of goods he has purchased at certain prices, and many times bought by borrowing money from a bank. He continued:

Now, if a wide and sudden fluctuation comes the inventory value of this stock on hand is immediately decreased accordingly, and he has a very severe loss, and his bank calls upon him for the payment of his loan and he is unable to do it because he is unable to dispose of that stock at a reasonable price. So, with people building all over the country who have purchased stock for those buildings. Just to refer to the panic of 1907, we had repeated letters and repeated calls from people we were selling goods to, who were not in a financial condition to survive if the demoralization which was threatened should become actual, asking us, as far as we could, to try and steady the market in order to prevent the demoralization, which would bring great loss upon them and in many cases absolute ruin. We know by actual experience that our customers desire the maintenance of reasonably stable conditions, so far as that is practicable (it is not always practicable, I am sorry to say; it is not always possible) in preference to wide, sudden, violent fluctuations and demoralization.

Q. Speaking of the employees and of the reduction of wages in 1904, did the corporation reduce wages until after it had passed its dividend on its stock? A. It did not. It passed the dividend first and reduced wages when it had to, and was the last to reduce. If you will look up the records, I think you will find that always in our acts we have followed our competitors in reducing prices, and followed them when we have increased prices, and followed them in decreasing the wages of our men and led them in increasing the wages of our men.

Treatment of Competitors

Q. What has been the policy of the corporation with regard to its competitors? A. We have treated our competitors as competitors. We have pushed our business

and pushed it hard. Our competition has always been active and keen; and we have done business with our competitors in a business way; but we have treated our competitors as gentlemen ought to be treated. At least, that has been our endeavor. If we had been dishonest or tricky or mean in our treatment of our competitors, it has not been done with the consent or knowledge of those in control of the affairs of the Steel Corporation, its board of directors, its finance committee, or its officers. We have tried to be frank and open with them. We admitted them to our mills. We have given them our figures. We have frankly stated to them our business conditions in detail and in every way have tried to give them the benefit of our experience.

It is not very becoming of me, perhaps, to speak of our good work, or to boast of our treatment of our competitors, and I perhaps ought to and would like to leave the determination of that question to our competitors themselves. I am not thoroughly familiar with the record in this case and do not know exactly what the testimony has been. I would be very much surprised, however, to find that any of our competitors in business had complained of our treatment of them, and should be very sorry if that were so. On the other hand, in olden days, the rule in this country was different in this kind of business. There was a competition that was bitter, fierce, destructive. If it did not absolutely drive competitors out of the business, it so harassed and injured them as to prevent them extending their business, or from taking advantage of their location, and at times compelled them to close their mills and discharge their employees and disrupt their organization.

Q. Has the Steel Corporation sought to obtain the customer of a competitor by secret rebates or departures from its open, published prices, or by sales lower than it was selling under other circumstances? A. It has not. I do not mean to be understood as saying that we never sold to any customer at a less price than we have sold to other customers.

Judge Gary then gave the familiar story of economies effected by the organization of the Steel Corporation. He told of its benefit to the workmen and of the economic benefit of the welfare and relief work. With regard to the latter he said:

I am not trying to say that we have done these things because we are better than other people, although I think the humanitarian's standpoint or reason is good enough for any one to put them in effect; but from the standpoint of dollars and cents it has been an advantage.

The Carnegie Policy by Contrast

Judge Gary had said that some of Mr. Carnegie's letters showed the spirit of the old competition. At the afternoon session some of them were read into the records. For example, a letter dated September 28, 1889: "My view is that sooner or later Harrisburg, Sparrows Point and Scranton will cease to make rails, like Bethlehem. The autumn of last year seemed as good a time to force them out of the business as any other. It did not prove so. The boom came and cost us a great deal of money." Judge Gary said: "There are other letters. These policies we have never believed in, nor advocated, nor followed."

In regard to the practical working out of the organization of the Steel Corporation, Mr. Gary said in part:

The plan was not as successful at the start as it became afterward. We brought together many different companies with different organizations and opinions which were more or less diverse. It required a great deal of patience and some time to thoroughly organize these different forces, to overcome and change some of the policies which had been pursued by some of the companies. For a large portion of this time, Mr. Schwab was ill and away from New York, and we were deprived of his ability, judgment and influence, and particularly his influence with the Carnegie forces.

Mr. Schwab, Judge Gary said, was thoroughly committed to the Carnegie policies, which were opposed by himself and Percival Roberts, Jr., president of the American Bridge Company and one of the directors. The executive committee was not a practical success, because of the different forces at work, although every man on it, he said, was capable of filling any position anywhere. Among them were Mr. Roberts, Daniel G. Reid, William Edinborn, and E. C. Converse. This committee was shortly abolished. The finance committee, which had been established as a check on it, assumed greater importance, although there were many obstacles to prevent its immediate success. Mr. Schwab was ill a long time and

finally resigned. Mr. Corey succeeded him at Mr. Schwab's suggestion. Then conditions began to grow better. He added:

Going back certainly for eight or nine years, I would say there has been the very best harmony and the organization has been improved and has been strengthened and it has been really ideal. So that from my present standpoint, looking backward, I can say that while we had more or less difficulty at first, the administration has become and is very successful.

Of course, I must admit that we have made mistakes from time to time of various sorts, and our subordinates sometimes have done things that we would rather they would not have done, that we would not have approved or would not have authorized. I think for a good many years their management has been fair and good.

How Its Policies Have Been Adopted

Q How, in practice, has the Steel Corporation put its policies into effect? A. Well, in different ways. Figuratively, there has been direct recommendation. Many years ago, I have forgotten the date, I brought before the finance committee for consideration the question of railroad rates and rebates, and I dictated a letter, which was sent to all the subsidiary presidents, that under no circumstances would any of our people be allowed to set any rebates, and if they were ever asked, to refer to us, and if we ever discovered that any were paid, we would take pains to see that it was not repeated.

I might say that many of the questions which have been considered and concerning which we have settled down to a policy have been the result of a natural evolution in trade. Many of our people had different notions 12 years ago from what they have at the present time, and that applies with greater or less force to all of us. Public discussions of questions, the attitude of the President of the United States, discussions in Congress and in the newspapers and magazines have all had their effect upon us. It has never been our policy or our practice to ignore or disregard or defy public sentiment.

We had presidents' meetings frequently, at which most of the officials, if not all, of the corporation were present, and questions of policy would come up and be considered. If we had reason to suppose there was something being done that ought not to be done, we would endeavor to correct it. In the earlier years we did not always find out exactly what was being done, but that is a thing of the long past. Then from time to time interviews would be given to the public press concerning some of the important questions, and in those interviews we would state our policy. I am sorry to say I felt it rather unwise to give interviews to newspapers since the time the committees met. I did not think it very becoming for us to say much about ourselves. These policies have tended to develop trade, to extend trade, to increase trade, to force competition, to prevent monopoly, to prevent wrong and imposition of any kind.

Doing No Wrong Nor Injury to Any Person

I want to say with emphasis, because it seems to me it is involved in this case, and that we are called upon to say it as a matter of fact, that the policy of this corporation has been to so manage and conduct its affairs as to make it certain that it did no wrong or injury to any person or any other interest. It has seemed to us that that was the important thing to consider in the management of a great corporation like this, which has been a quasi public corporation.

It is true that we have represented the stockholders of the corporation and have endeavored to protect their interests and to earn and distribute dividends, but we have acted upon the assumption that we were best serving the stockholders, the peculiar interests of the stockholders, if we were so managing the corporation as not to harm anyone, and so as to be of real substantial benefit to everyone, whether an employee or competitor or consumer or the general public. And we have endeavored to set, and I believe have set, a good example in the business world. Now, if that seems boasting, I ask the pardon of everybody.

Since the organization of the corporation, new companies have been built up and thrived, and become very large and prosperous; old companies have extended their properties and very greatly increased their capacity; competition was never before so healthy and strong and vigorous and successful as it has been in this country for the last good many years.

To substantiate his statement as to the condition of competition Judge Gary read from a memorandum giving the percentage of the country's steel production which was manufactured by the corporation in 1901 and 1911. It

showed that the percentage made by outside companies had increased.

Acquisition of Properties in Recent Years

Asked about the acquisition of companies since the original consolidation was formed, Judge Gary told about taking over the Shelby Tube Company. He said:

It was offered to us a good many times. The company was in rather straitened circumstances; at least it was so represented to me by some of the owners and officers of that company. It had a patent that was considered good and valuable. The National Tube Company had intended to make seamless tubes, but had not been successful. It had tried two or three patent processes. Our percentage of production now is very much less than the percentage of our competitors, I think, in seamless tubes.

As to taking over plants, Judge Gary said in general: "I think in no instance have we ever tried to purchase the plant of a growing concern. The very few properties we have bought we have purchased after the owners urged us to buy, or at least requested us, generally urging us to buy. We have intended to take care of our customers and their requirements. We have generally done that with perhaps some exceptions. We have not increased the capacity of the Wire Company, as to trade, and as our own customers demanded, because the percentage we started with was large, and we did not think it advisable or the best thing to do."

In regard to taking over the Union Steel Company Judge Gary said that one of the reasons this was done was to obtain the services of Henry C. Frick, who was interested both in the Union Company and in the United States Steel Corporation, but took no active part in either because of holding an interest in both. He continued: "He was a man of good judgment and high standing, and moreover, was thoroughly familiar with the Carnegie Company. Mr. Schwab, as I said, had been ill a good deal. He was sick and away. He was not here at all. We needed a man living in New York who would take an active interest in the corporation and was familiar with the Carnegie organization and property. It was especially desirable, therefore, that we secure the services of Mr. Frick."

"Now, whether it is legitimate or not, these facts were important in considering the question as to whether we should take over the Union Steel. It was taken over on the basis of actual cost, as I remember."

Judge Gary said that the corporation had never insisted on the provisions put in by the lawyers that some of those connected with the companies taken over would not engage in competing business for a term of years. He cited as examples the Mellon interest in the McClintic-Marshall Construction Company and William H. Donner's connection with the Cambria Steel Company.

Asked about taking over the Clairton Steel Company, Judge Gary told of the embarrassment of the Crucible Steel Company which had advanced the money with which the Clairton steel plant was built. He said:

The president of the Crucible Steel Company, Frank D. Smith, came to me several times and was very anxious to sell the property, offering it at cost. Later, after much negotiation, and when the price was \$3,000,000 or \$4,000,000 less than it cost, we decided to buy. These men were wealthy and successful, but they had gone in a little deeper than they wanted to from the standpoint of the Crucible Steel Company. We did not take it over, however, until after we had made a very careful examination of the property. In their furnaces they had demonstrated that they could use Mesaba ore without any mixture of the old range ores. That was really important to consider at that time. They also had good ore, and we needed ore, and very good coking coal property. First of all, we needed the capacity, and it simply saved us from building exactly the same thing.

Regarding the purchase of Northwestern ore properties, Judge Gary said in part: "There were offers by the hundreds of millions of tons which we turned down. We could have secured during those years a very large portion of what were afterward called the Hill ores, which now aggregate, according to Hill estimates, 700,000,000 or 800,000,000 tons. As we found that we needed more ore for our own purposes and that there were large quantities of ore outside of our holdings not belonging to our competitors, so that there was no reason whatever why we should not buy ore, then we began taking care of our own necessities and bought ore properties occasionally."

The Change of Sentiment in Regard to Pools

Continuing his testimony on Monday, Judge Gary told of his connection with pools in the steel industry, and declared that William E. Corey was mistaken when he testified that Judge Gary had attended a plate pool meeting in 1902 or 1903.

Judge Gary said there had been a change of sentiment from the early days in regard to pools, which were then considered legal, accompanied by different views on the part of lawyers and in decisions of the courts. He thought the courts had extended the meaning of the Sherman law and when their trend became apparent from the Northern Securities decision he took steps to have pools in which the Steel Corporation's subsidiaries were concerned brought to an end. He was surprised, he said, on learning later that some of these pools had persisted as late as they did. It was only three years ago that the wire pools were broken up and the participants indicted and fined.

Pool Opinion by Senator George F. Hoar

As showing the view of agreements to apportion tonnage and fix prices that prevailed some years ago, Judge Gary put in evidence an opinion by the late Senator George F. Hoar of Massachusetts, who, he said, he understood really framed the Sherman law, although similar contentions were advanced in behalf of ex-Senator Edmunds of Vermont. This opinion, favorable to pools, was written within a year after the Sherman law was enacted. Judge Gary led up to it by saying that his first contact with the pool question was in 1897, when he was connected with an effort to combine certain wire interests. He had heard of the opinion and obtained a copy from one of the wire companies for which Senator Hoar had acted as counsel.

The question submitted to Senator Hoar, the opinion stated, was "whether an agreement with each other by several companies, by which they stipulate that their product shall not be sold for less than an agreed scale of prices, and that each shall pay into the common stock, to be divided in an agreed proportion, all profits by it received beyond what comes from a specified amount of sales, is illegal, 'under the Sherman law.'" In reply Senator Hoar said:

I think the contract above proposed is reasonable and would be so held by the courts of the United States. * * * The opinion of the courts, like the opinion of the rest of the community, may vary in different generations as to what is reasonable. But the question of reasonableness will be a question of law for the courts, to be determined upon all the facts and in the light of experience, the business habits, and the public opinion of the present time. This being my opinion, I think the parties to the agreement above proposed would not be likely to be convicted of an offense under the statute of last year.

I cannot see any distinction in principle between a contract of workmen not to work for less than a stipulated sum as wages and a contract of employers not to sell their product for less than a stipulated sum. Both these being intended for their legitimate protection and not accompanied with any stipulation for unlawful, oppressive, or fraudulent methods, seem to me to be lawful within

the policy of the law as it now exists, and not to be in restraint of trade but in advancement thereof.

Helped to Form a Rail Pool

Judge Gary told of a rail pool which he helped to form before the Steel Corporation was organized. He and H. H. Porter of the Federal Steel Company and H. C. Frick and Andrew Carnegie for the Carnegie Steel Company met at Mr. Carnegie's house and signed a paper providing that the four should recommend to the two companies that they divide equally the total tonnage in standard rails received by both. Later the presidents of the Colorado Fuel & Iron Company and the Cambria, Lackawanna and Pennsylvania Steel companies became parties to the agreement on the basis of certain percentages of the total orders of the several companies.

Afterward the president of the Colorado Company presented a formal agreement to do what the presidents had agreed to "recommend," but this Judge Gary refused to sign, as he was not certain that it would be legal. It was not signed by any of the companies. Up to the time of the formation of the Steel Corporation, he said, there was a disposition and an effort to keep the tonnages in accordance with these percentages and transfers of tonnage were made for this purpose. He added:

If I attended any meetings of the presidents after the corporation was formed I don't remember it, with the exception of a meeting five or six years ago to consider the question of special specifications by the Pennsylvania Railroad. Mr. Corey was very much mistaken about my attending plate or structural pool meetings in 1902 or 1903. I remember attending a meeting at the Waldorf in 1899 or 1900, at which the subject of making some arrangement concerning plates was discussed. I declined to enter into it. I have no recollection of attending any meeting of structural manufacturers.

In 1904 Changed His Mind About Pools

In the latter part of 1904, Judge Gary said, he changed his mind about the legality of pools, in view of court decisions and change in public opinion, and took steps which led to their prohibition so far as the subsidiaries were concerned.

He again detailed the events of the panic of 1907 which led up to the absorption of the Tennessee Coal, Iron & Railroad Company, with which our readers are now so familiar.

As to the corporation's railroads in the Lake Superior district, he said they served independents as well as the corporation, and no complaint had ever been made of rates except one, which had been withdrawn. Rates were reduced in 1911, just before the dissolution suit was filed.

The Hill ore leases, Judge Gary said, were made because competitors were acquiring ore supplies more rapidly than the corporation. In canceling the leases he was influenced partly by the fact that they had been attacked by the Commissioner of Corporations as intended to obtain a monopoly. No such object was in mind in making them, he said.

Pulverized Fuel for Boilers.—The use of pulverized fuel for steam boilers was recently discussed by C. H. Wright in the *Electrical World*. A vertical gas-jet inlet, so that a mushroom-shaped flame is produced within a closed ring of vertical boiler tubes, which constitute the steam-generating plant, has overcome many of the difficulties met in trying to adapt powdered fuel to steam-generating apparatus. Ignition takes place shortly after the stream of coal dust and air enters the furnace. The mixture rises as a central column until it strikes the top and turns downward when combustion has practically ceased, the products of combustion forming a sort of sheath or gas lining which prevents blowpipe action but does not prevent radiant heat. The ash is converted into a liquid which is deposited on the brick lining of the furnace, subsequently dropping into the ash pit. The result is that the furnace automatically keeps clear of slag.

A new company has been formed in France to manufacture steel by electricity. It will be known as the Société des Acieries d'Angueville, at Angueville (Savoy); capital, \$250,000.

Cincinnati Machinists' Hours.—The question of wages and hours of the machinists in their employ has been under consideration for some time by the companies which are members of the Cincinnati branch of the National Metal Trades Association. The announcement was made this week that beginning with June 1 all the members of the Cincinnati branch have reduced working time in their shops from 55 to 52½ hrs. per week, with no corresponding reduction in wages.

The Acklin Stamping Company, Toledo, Ohio, is compelled by increasing business to enlarge its plant, and for that purpose it has purchased a lot having 40 ft. frontage on Dorr street and 150 ft. deep. A contract has been awarded to the American Construction Company for the erection of a warehouse and shipping room. The building will be of modern construction, equipped with an overhead trolley system and will afford largely increased storage facilities, thus enabling the company to carry in stock a larger supply of sheet steel, brass and aluminum. The stock to be carried probably will amount to about 1500 tons.

Hights and Areas for Factory Buildings*

Views of Fire-fighters Regarding Buildings With and Without Sprinklers

BY IRA H. WOOLSON

It is logical to assume that the men best fitted to determine safe limits of hights and areas of factory buildings are the men who have made a life work of combating fires under all conditions of weather and hazard. With this idea in mind, the writer communicated with all the fire marshals and fire chiefs in the United States representing cities of over 20,000 population. A set of eight questions and a letter of explanation were sent to each. Fire chiefs as a class are not good technical correspondents, therefore it was not surprising that only one-third of the men addressed responded to the appeal. However, replies were received from 117 representative cities well distributed as to size and geographical location.

1. What should be the greatest height allowed for manufacturing or warehouse buildings without sprinkler equipment? Brick and joist construction? Fireproof construction?
2. Take the same question as No. 1, but assume the buildings to be fully equipped with automatic sprinklers.
3. What should be the greatest floor area allowed in the same class of buildings without sprinkler equipment?
4. If the same buildings were fully equipped with automatic sprinklers what area would you approve?

Naturally, and quite properly, the replies reflect the local conditions, such as the efficiency of the fire department, the water pressure, the combustibility of the goods being manufactured, the number of sprinkler equipments in service, and the degree of congestion among the buildings. However, all conditions were represented, and the summary in Table 1 of so large a number of opinions should indicate fairly well the average condition throughout the country. The answers regarding allowable hights were much more uniform than those relative to area. It is significant that 83 per cent. of the replies would limit the height of a fireproof sprinklered factory building to less than ten stories. The opinions in reference to height of the other classes of buildings were exceedingly uniform, and consistently low. Replies as to permissible areas in sprinklered buildings were widely divergent, but for the unsprinklered classes they were more uniform than would naturally be expected considering the great diversity of conditions under which they were prepared.

Table 1—General Average of 99 to 111 Replies Received from all Classes of Cities

Type of Buildings	Stories in Height	Area between Fire Walls in Sq. Ft.
Non-fireproof, not sprinklered.....	3.1	6,300
Fireproof, not sprinklered.....	4.9	12,300
Non-fireproof, sprinklered.....	4.6	12,800
Fireproof, sprinklered.....	7.0	27,100

Average story height was 12 to 13 ft.
The variation in the number of replies (averaged) resulted from some incomplete answers.

Attitude Toward Automatic Sprinklers

It is evident from the figures given that the fire chiefs have no settled policy among themselves as to the credit that should be given to an automatic sprinkler equipment as a fire extinguishing device. A few enthusiasts would permit unlimited area in a sprinklered building, while on the other hand a considerable number would give very little or no increase, when sprinklers are installed. Two chiefs stated that their unfortunate experiences with sprinklers had caused them to lose faith in their reliability. As a whole, however, they are strongly in favor of sprinklers and are inclined to permit over generous areas in buildings so equipped.

In order that the replies may be intelligently interpreted they have been separated into three groups, according to size of the city represented, and each group has been analyzed to show the character of the answers given to each question. In each group about the same number of men gave high answers to all questions, the proportion being one-quarter to one-half of the number in the group. The uniformity of height limits, and the lack of it in the area limits, is very apparent in all groups. The largest area values are given in groups comprising the smaller cities. This is significant and needs explanation.

Occasionally the fire chief of a small city has experience which would abundantly qualify him to estimate

properly the merits of fireproof construction and sprinkler equipments; more often, however, his city has meager protection of this kind, and consequently he has little opportunity to judge of their efficiency, and it is not strange that he should be a bit extravagant in the credit he would give them.

The most rigid restrictions on area are found in the group embracing the large cities. As fireproof construction and sprinkler equipments are common in most of our large cities, it is reasonable to assume that the fire chiefs of such cities would have had much more experience with such methods of protection, and be better able to decide what increase should be given in the size of a building when such protection is provided, than their less experienced fellow officers in smaller towns. It is thought quite proper to assume that their figures are more nearly correct and should be given the most weight.

With these thoughts in view, Table 1 has been changed somewhat to be more in accord with the weight of evidence. It is believed, therefore, that Table 2 represents more correctly the consensus of opinion among the fire chiefs of the country best qualified to judge as to what should be the proper limits of height and area for factory buildings.

Table 2—Allowable Hights and Areas in Factory Buildings

Type of Buildings	Stories in Height	Area between Fire Walls in Sq. Ft.
Brick and joist construction, not sprinklered	3	6,000
Fireproof construction, not sprinklered....	5	10,000
Brick and joist construction, sprinklered....	5	13,000
Fireproof construction, sprinklered.....	8	20,000

Ford Motor Buffalo Plant Closed

As a result of the machinists' strike at Buffalo, orders have been received from headquarters by William Knudsen, manager of the plant of the Ford Motor Company in that city, to close the Buffalo works permanently and to ship the machinery to the company's main plant at Detroit. By this action of the company 450 skilled mechanics, heretofore employed in the Buffalo works, are thrown out and the large amount of pressed steel and other machine work which has been done in Buffalo will hereafter be turned out at the Detroit plant. The equipment is being rapidly forwarded to Detroit and Mr. Knudsen will soon follow.

It is possible the company may continue a portion of the Buffalo plant as an assembling and distributing depot. In that event only a few assemblers, painters, etc., will be employed to care for the work requisite in a branch plant of that character.

German Open Hearth Steel Replaces Bessemer.—

In Upper Silesia the basic open-hearth process is rapidly supplanting the basic Bessemer. According to the annual report of the Oberschlesischen Berg und Hüttenmannischen Verein of 1912, all the steel plants in that part of Germany are now utilizing the open-hearth steel process except the Friedenshütte, where basic Bessemer is still being produced. Open-hearth steel increased from 877,500 tons in 1911 to 1,050,000 tons in 1912, or about 19 per cent., while the production of basic Bessemer remained about stationary. Of a total production of 264,000 tons of forge pig iron, only 100,000 tons was worked up in puddling furnaces, the remainder going into open-hearth steel.

Under date of May 29, the National Tube Company, Pittsburgh, issued a new discount list on Boston casing pipe which is intended for water wells, etc., but not for oil or gas wells. The new list supplants the list of January 1, 1913, and carries an advance of one point on 2 to 3¼-in., two points on 3½ to 4-in. and 4¼ to 6½-in., one and a half points on 7¼ to 9½-in. and one point on 10½ to 12½-in. List prices per foot conform somewhat closely to an average of 10c. per lb., so that one point change in the list is equivalent to about \$2 per net ton.

No. 4 Eliza furnace of the Jones & Laughlin Steel Company at Pittsburgh, which has been out of blast for relining and repairs, will be making iron this week. No. 2 Eliza will be blown out about June 15 for relining and repairs.

*From a paper read before the American Society of Mechanical Engineers at Baltimore.

Plate, Sheet and Tin Plate Production in 1912

Output of Each in the United States in 1912 Far Ahead of That in Any Former Year

Statistical Bulletin No. 5 of the Bureau of Statistics of the American Iron and Steel Institute gives the statistics of production of iron and steel plates and sheets, black plates, or sheets, for tinning, and tin plates and terne plates in the United States in 1912. William G. Gray is in charge of the bureau. For 1911 and previous years the statistics were compiled by the American Iron and Steel Association.

Production of Plates and Sheets

The production of plates and sheets in 1912, excluding nail plate and skelp, amounted to 5,875,080 gross tons, against 4,488,049 tons in 1911, an increase of 1,387,031 tons, or over 30.9 per cent. The maximum production was reached in 1912. The year of next largest production was 1910. The production of nail plate and skelp will be given later. The following table gives the production by States of plates and sheets from 1910 to 1912, excluding nail plate and skelp. Tie plates are included for 1911 and some previous years but not for 1912.

States—Gross tons	1910	1911	1912
New Eng., N. Y. and N. J.	141,999	106,298	108,477
Pennsylvania	2,808,883	2,405,247	3,166,872
Del., Md., and Virginia	23,863	22,060	19,488
West Virginia	225,649	246,893	317,718
Kentucky and Alabama	69,610	67,930	65,598
Ohio	1,052,414	1,168,879	1,493,825
Ind., Ill., Wis., Mo., Wyo. and Cal.	633,066	470,742	703,102

Total4,955,484 4,488,049 5,875,080

In 1912 there were 131 works in 14 States which rolled plates or sheets, against 139 works in 15 States in 1911, and 150 works in 17 States in 1910. In the following table the production by States in 1912 of iron and steel plates of No. 12 gauge and thicker is separated from the production of iron and steel sheets of No. 13 gauge and thinner.

States—Gross tons	Plates	Sheets	Total
New Eng., N. Y. and N. J.	63,776	44,701	108,477
Pennsylvania	2,005,293	1,161,579	3,166,872
Del., Md., West Va., Ky. and Ala.	30,877	371,927	402,804
Ohio	543,446	950,379	1,493,825
Indiana	149,691	228,940	378,631
Illinois, Wisconsin and Missouri	242,117	82,354	324,471

Total for 1912.....3,035,200 2,839,880 5,875,080

Total for 1911.....2,334,341 2,153,708 4,488,049

In 1912 there were 39 works which rolled plates but did not roll sheets, 55 which rolled sheets but did not roll plates, and 37 which rolled both plates and sheets. At the close of 1912 three works to roll sheets or black plates were being built.

Table 1 gives separately the production of iron and steel plates and sheets since 1905 in gross tons. Similar statistics for 1904 and immediately preceding years were not collected. Black plates, or sheets for tinning are included.

The following table gives the approximate annual consumption of iron and steel plates and sheets in this country from 1905 to 1912 in gross tons, imports for each year having been added and exports deducted. Iron plates and sheets were not separated from steel plates and sheets for 1900, 1901, 1902 and 1903.

Years, Gross tons	Production of plates and sheets			Add imports	Deduct exports	Approximate consumption
	Iron	Steel	Total			
1905	72,156	3,460,674	3,532,230	2,356	75,097	3,459,469
1906	74,373	4,107,783	4,182,156	3,231	110,700	4,074,687
1907	74,038	4,174,794	4,248,832	3,748	122,696	4,129,884
1908	54,033	2,595,660	2,649,693	2,629	104,993	2,547,329
1909	76,202	4,158,144	4,234,346	4,720	180,047	4,059,019
1910	91,118	4,864,366	4,955,484	6,152	27,452	4,687,115
1911	89,427	4,398,622	4,488,049	2,453	372,373	4,118,129
1912	75,044	5,800,036	5,875,080	3,300	546,521	5,331,859

Production of Black Plates for Tinning

The production of black plates, or sheets, for tinning in 1912 amounted to 982,197 gross tons, against 795,598 tons in 1911, an increase of 186,599 tons, or over 23.4 per cent. It has been necessary to estimate the output of a few plants in late years.

The production in 1912 was much the largest in our history. The year of next largest production was 1911. The following table gives the production in the last three years in gross tons:

States—Gross tons	1910	1911	1912
Pennsylvania	427,530	483,576	563,738
Maryland and West Virginia	132,483	154,900	207,158
Ohio, Indiana and Illinois	152,124	157,122	211,301
Total	712,137	795,598	982,197

Of the total production in 1912 about 5378 tons was rolled from iron and about 976,819 tons from steel, while in 1911 about 3515 tons was rolled from iron and about 792,083 tons from steel. The States which made iron black plates in 1912 were Pennsylvania and Ohio.

In 1912 there were 34 active black plate works, as compared with 31 in 1911 and 35 in 1910. In 1912 there were three idle works, as compared with four in 1911, four in 1910, nine in 1909, 13 in 1908 and 10 in 1907. Two black plate plants were being built in Ohio at the close of 1912.

The following table gives the production of black plates or sheets, for tinning, since 1894. Prior to 1894 the statistics of black plate production were not separately classified.

Years	Gross tons	Years	Gross tons	Years	Gross tons
1894	52,359	1901	398,026	1908	513,771
1895	129,615	1902	365,743	1909	606,482
1896	185,387	1903	490,652	1910	712,137
1897	271,886	1904	472,569	1911	795,598
1898	345,254	1905	507,587	1912	982,197
1899	375,000	1906	576,079		
1900	315,000	1907	504,072		

Production of Tin Plates and Terne Plates

The production of tin plates and terne plates in 1912 amounted to about 2,157,055,000 lb., or 962,971 gross tons, as compared with about 1,756,070,000 lb., or 783,960 tons, in 1911, an increase of 400,985,000 lb., or 179,011 tons. Of the total in 1912 extra 877,526 tons was tin plates, as compared with 713,227 tons in 1911, an increase of 164,299 tons; and 85,445 tons was terne plates as compared with 70,733 tons in 1911, an increase of 14,712 tons. The combined production of tin plates and terne plates in 1912 was much larger than in any other year. The following table gives the production by States in 1912.

States—Pounds	Tin plates	Terne plates	Total
Pennsylvania	1,179,468,000	81,872,000	1,261,340,000
West Virginia	347,544,000	86,030,000	433,574,000
Ohio, Indiana, Illinois and Michigan	438,647,000	23,494,000	462,141,000
Total for 1912	1,965,659,000	191,396,000	2,157,055,000
Total for 1911	1,597,629,000	158,441,000	1,756,070,000

All the tin plates produced in 1912 were made of steel, but of the terne plates about 11,250,000 lb. was made of iron, as compared with about 7,720,000 lb. in 1911. In 1911 and 1912 the iron terne plates were made in Pennsylvania and Ohio. Small quantities of pure lead coated and aluminum coated steel sheets were also produced in late years.

In 1912 there were 20 plants in six States which made tin plates but not terne plates, five plants in two States which made terne plates but not tin plates, and

Table 1—The Production of Iron and Steel Plates and Sheets, 1905-1912

Years, Gross tons	Plates—No. 12 and thicker—			Sheets—No. 13 and thinner—			Grand total
	Iron	Steel	Total	Iron	Steel	Total	
1905	10,022	2,031,184	2,041,206	62,134	1,428,890	1,491,024	3,532,230
1906	23,333	2,508,219	2,531,552	51,040	1,599,564	1,650,604	4,182,156
1907	30,277	2,629,783	2,660,060	43,761	1,545,011	1,588,772	4,248,832
1908	31,679	1,239,342	1,271,021	22,354	1,356,318	1,378,672	2,649,693
1909	32,332	2,346,766	2,379,098	43,870	1,811,378	1,855,248	4,234,346
1910	37,763	2,769,965	2,807,728	53,355	2,094,401	2,147,756	4,955,484
1911	46,147	2,288,194	2,334,341	43,280	2,110,428	2,153,708	4,488,049
1912	33,349	3,001,851	3,035,200	41,695	2,798,185	2,839,880	5,875,080

12 plants in three States which made both tin plates and terne plates. The number of active plants in 1912 was 37, against 34 in 1911, and the number of idle plants was five, against seven in 1911. At the close of 1912 three plants were being built.

The following table gives the production of both tin plates and terne plates in the United States from the beginning of the industry in 1891 to the end of 1912. From July 1, 1891, to June 30, 1897, the statistics were collected by Col. Ira Ayer for the Treasury Department, and from July 1, 1897, to December 31, 1911, they were compiled from reliable sources of information, but chiefly from the records of the American Iron and Steel Association. For 1912 the figures were compiled by the Bureau of Statistics of the American Iron and Steel Institute.

Years—Pounds	Tin plates	Terne plates	Total pounds
1891 (second 6 months) . . .	368,400	1,868,343	2,236,743
1892 (calendar year) . . .	13,921,296	28,197,896	42,119,192
1893 . . .	64,536,209	59,070,498	123,606,707
1894 . . .	102,223,407	64,120,002	166,343,409
1895 . . .	165,927,907	88,683,488	254,611,395
1896 . . .	270,151,785	89,058,013	359,209,798
1897 (first 6 months) . . .	203,028,258	49,545,643	252,573,901
1897 (second 6 months) . . .			322,205,619
1898 (calendar year) . . .			732,289,600
1899 . . .			808,360,000
1900 (census year ending May 31) . . .	707,718,239	141,285,783	849,004,022
1901 (calendar year) . . .			894,411,840
1902 . . .			806,400,000
1903 . . .			1,075,200,000
1904 (census year ending Dec. 31) . . .	867,526,985	158,857,866	1,026,384,851
1905 (calendar year) . . .			1,105,440,000
1906 . . .	1,100,373,000	193,367,000	1,293,740,000
1907 . . .	996,650,000	156,447,000	1,153,097,000
1908 . . .	1,048,896,000	154,179,000	1,203,075,000
1909 . . .	1,179,858,000	190,930,000	1,370,788,000
1910 . . .	1,450,821,000	168,184,000	1,619,005,000
1911 . . .	1,597,629,000	158,441,000	1,756,070,000
1912 . . .	1,965,659,000	191,396,000	2,157,055,000

The following table gives our approximate annual consumption of tin plates and terne plates from 1907 to 1912, imports for each year having been added and exports deducted.

Years—Gross tons	Production	Add imports	Deduct exports	Approximate consumption
1907 . . .	514,775	57,773	10,203	562,345
1908 . . .	537,087	58,490	11,878	583,699
1909 . . .	611,959	62,593	9,327	665,225
1910 . . .	722,770	66,640	12,445	776,965
1911 . . .	783,960	14,099	61,381	736,678
1912 . . .	962,971	2,052	81,694	883,329

In 1911 our production of tin plates and terne plates first exceeded our consumption, the difference amounting to 47,282 tons. In 1912 the production exceeded consumption by 79,642 tons.

Of the exports in 1912 47,095 tons was sent to Canada, 5878 tons to China, 4459 tons to Argentina, 3901 tons to British India, 3190 tons to Hong Kong, 2924 tons to Japan, 2673 tons to Brazil, 2371 tons to Mexico, 2037 tons to Cuba, 1715 tons to the Straits Settlements, 1452 tons to Chili and 3999 tons to the Philippines, Australia, Africa, Peru and a few other countries. In 1912 over 8.4 per cent. of the total output was sent to foreign countries.

The Work of the Technical School

Its Varied Character and Product, But One Aim in All Its Training

Prof. Henry M. Howe, Columbia University, New York, in discussing the paper of Prof. Frederick Crabtree on specialization in technical education, spoke as follows at the annual dinner of the American Iron and Steel Institute in New York May 23:

"The philosophy of each philosopher is the aspect of the universe from his individual point of view, and the opinion of each educator as to education represents his own bias, the resultant of his natural way of thinking and of his life's environment. The diffuse Jones, a natural administrator, looking at life from the standpoint of an administrator, of the man of many and diffuse simultaneous tasks, overvalues administration and the preparation for administration, and undervalues and too often ridicules its opposite, the power of concentration and speculation; that power through which alone can difficult and complex problems be solved—the power of shutting out from the mind for hours everything but the little set of elements of the present problem, of living and sleeping with the problem till its solution flashes forth. These are two extremes, the diffuse administrator and the self-

concentrating speculator. Those of each class overvalue their own class and undervalue the other. Industry needs not only these opposite types, but every possible shade of man between these two extremes. To say, 'This length of course is the best' means only 'It is the best for turning out the particular kind of man that I have prominently in my mind.'

"You remember Procrustes, who made his bed fit every traveler by lopping off the tall one's legs and stretching the short ones on a rack. Beware the narrow and cocksure Procrustean of every walk of life, who would have all institutions shaped to fit their own pet ideals, regardless of the need of the world of widely different products.

"Industry, indeed, needs relatively few pure administrators and relatively few pure speculators, though it needs them urgently; but it does need many men of each of many different types between the extremes. Many draftsmanship can well be filled by men of a relatively low grade of intelligence and relatively little training; but industry needs in addition many whose powers of imagination have been developed by a thorough training. To compel the former to take the thorough training which befits the latter would be as idle as to compel the latter to be satisfied with what suffices the former.

Many Kinds of Technical Men

"Do not confuse yourself with thinking that 'technical men' are all of one kind, and that one kind of education fits them all. You might as well group all steels together as one, and needing one preparation rivet and tube steel, high speed tool steel, file steel, and rail steel. Industry needs many steels, each of its own composition and prepared in its own fit way, and many kinds of technical men each of its own appropriate training and inborn aptitudes.

"The habit of concentration as distinguished from action invaluable as a preparation for some technical work, but for some other technical work that habit would be an injury to be avoided as far as is compatible with getting the needed knowledge. One man's meat is another man's poison. He who likes that meat should not ram it down the throat of those whom it poisons.

"Therefore, let each institution pursue its own ideal. He who shapes round pegs for round holes should not ban but bless his neighbors who square up their pegs for the coexistent square holes. Jones is familiar with places for which as much as four years of preparation have indeed to be tolerated; Smith is familiar with those for which a five-year preparation is, alas, regrettably short. Each is right, one seeing the silver and the other the gold side of the shield.

Technical School Presidents Need Improving

"Technical education, though its immediate purpose is to make technical practitioners, has for its ultimate and main purpose to make citizens. To educate is to lead out the powers of the mind.

"I count life just a stuff

To try the soul's strength on, educate the man."

"What technical education needs most is improvement in its breed of presidents. These should give their teaching staff that which they too often lack, a true conception of the relative importance of learning and mental training.

"Theories are never absolutely true; they are only convenient falsehoods for assembling facts. A conception of their temporary and makeshift nature and the degree of credibility of the evidence on which they rest; familiarity with wise and effective methods of testing this and the other evidence on which all our decisions must needs rest—it is far more important to possess these than to understand this or that theory, as to which you can always refresh your memory by turning to Kent's Pocket-book or to a treatise on physics, chemistry or whatever.

"The mind is our tool. It is much more important to learn how to use this tool wisely and effectively than to cram it with facts. The graduate's greatest value is his power of thought; but of all educational things the two most difficult are to induce the student to think at all and to induce his teacher to try to make him think. It is by their power of causing their teaching staff to educate while they teach that the fitness of college presidents should be tested."

Claims and Their Adjustment*

Classification of Claims—Each Case Should Be Diagnosed—How Claims Arise—Adjustments Should Be Based on Equity

—BY GEORGE P. EARLY†—

In the manufacture of steel products, there are certain irregularities that are avoidable and others that are unavoidable. Those which can be prevented should have attention, and there should be a proper appreciation on the part of the buyer of those that cannot be prevented. The buyer should bear in mind the limitations of good practice and that the workmen in many features of manufacture are dealing with forces that are unseen and not altogether controllable.

Four Classes of Claims

Complaints and claims against steel products may be properly divided into four classes:

1. Those for which the manufacturer is responsible because of defective steel, because of inefficient mill practice, such as insufficient annealing, bad surface, off color, unreasonable variation in gauge and inaccurate shearing, as well as because of breakage and faulty workmanship in fabrication.

2. Those for which the carrier is responsible on account of material becoming damaged or lost in transit.

3. Those for which the customer is responsible, either because of his improper practice in using the material or by reason of his innocently using the wrong grade, or because he knowingly and for economic reasons purchases a cheaper grade.

4. Claims on account of labor charges and damages of a consequential character.

Diagnosing the Case

Immediately upon receipt of a complaint or claim it should be given a file cover which should be numbered and on the face of which should be recorded the name and address of the complainant and other information necessary for a complete record. All subsequent correspondence concerning the claim should be placed consecutively in the file. If the complaint is based upon the quality of material, the information should be developed, if not given when the complaint is made, the grade of material and whether such material had been used successfully heretofore for the same purpose, and whether a reasonable test or examination had been made, and from what mill the material was shipped. When this information is obtained, the claim man should be able to suggest relief at once. If the case is serious, he should send a representative to give the matter personal attention.

It sometimes happens that a customer with conspicuous inconsideration will curtly write in saying: "The last car is no good. Please give shipping instructions." He doesn't give any information at all as to the grade of the material, the nature of the trouble, or the mill that shipped it. Sometimes a customer with a tropical temper becomes irritated when you ask him for facts. And he thinks that, because you don't do as he wants you to immediately, you are indulging in unnecessary red tape and that you are seeking to evade responsibility. Such a customer fails to realize that we must rely entirely upon such information before we are able to give relief, and that for this reason he should cheerfully co-operate with us.

When a complaint or claim is received the company's treasurer should be notified, so that if the invoice is not paid promptly he may know the probable cause. The general sales, operating and order departments, as well as the sales office through which the sale was made, and also the manager of the mill at which the material was manufactured, should all be notified. Everybody interested in the complaint should be advised, so that if there are any other shipments of the same grade to be made steps may be taken to correct the trouble if possible.

*From a paper read before the American Iron and Steel Institute, New York, May 23, 1913.

†Special agent, American Sheet & Tin Plate Company, Pittsburgh, Pa.

How Claims May Arise

In 30 consecutive years of experience as a claim man, I have observed that, while most complaints and claims are conscientiously made, they are usually, although perhaps unconsciously, very much exaggerated. I have also noted that there is some frailty in human nature that causes us to place responsibility for trouble on the fellow farthest away from ourselves. I have also observed that the users of steel products are often too much inclined to place the burden of proof upon the manufacturer to show that he is not only not responsible for faulty material but to demonstrate for them that the fault is theirs. There should be a more co-operative spirit of fairness on the part of customers toward the manufacturer in attempting to ascertain the cause of trouble, no matter who is responsible for it, and then there should be more mutual help in trying to correct it. For instance, if a customer is fabricating material and it breaks, the breakage may be due to either defective steel or insufficient annealing or because of too great variation in gauge. It rarely occurs to the customer that the trouble may be due to the fact that his tools are not suitable for the operation, or that he may be using an improper grade of material, or that he is not handling the material properly.

Adjusting Claims Sold by Weight

All claims should be based on the conditions of sale. If material is sold by weight, a claim for shortage should be based on short weight, and that ascertained by weighing the material on scales that are known to be as accurate as it is possible to have them. It is usual for manufacturers to employ scale experts whose business it is to see that their scales are in good condition. They take every precaution possible to have the invoiced weight correct and yet they may make mistakes. It is, however, unfortunately a frequent practice of customers to conclude immediately, if they find their weight less than the invoiced weight, that theirs is right and the shipper's wrong.

A claim for short weight should not be based on count of pieces. Sometimes a customer will figure the theoretical weight of a piece and then weigh a couple of pieces and from their weight figure the weight of the shipment from the number of pieces invoiced, which are only estimated, as a rule, and then base a claim upon such calculation without considering at all the usual allowable variation above or below the theoretical weight.

A variation of one-half of 1 per cent. in the shipping and receiving weight on a carload shipment should be considered as reasonable, and no claim should be made unless the shortage is in excess of that. Yet there are customers who will present claims for shortages based on a count of the number of pieces and stubbornly insist upon payment of such claims, thinking the claim agent unreasonable if he declines them.

Claims Due to Damage in Transit

When material is damaged in transit, the consignee should be willing to co-operate with the shipper to reduce the loss of the carrier, providing he is not asked to assume any loss. No one should seek to thrive upon the misfortune of another. There is a general disposition on the part of the consignee to flatly reject the entire shipment and have nothing to do with it. Of course, we appreciate that it is perhaps often inconvenient for a jobber to handle damaged material, but there is no reason why a manufacturing customer should not co-operate in handling damaged shipments when he is held harmless of any loss. It is our experience that usually at least 75 per cent. of so-called damaged shipments are not damaged at all. And it seems to us that it is not asking too much of a consignee that he accept the shipment as damaged, assort it at

shipper's expense, and reject only the damaged material or use it at a mutually satisfactory price.

In the past ten years there has been a tremendous increase in the use of steel products for the manufacture, not only of new articles, but of articles that were formerly made from wood and brass. Requirements as to working qualities, such as stamping and forming, to surface, to color, or to decimal thickness or gauge, have become extremely exacting.

The Tendency to Cut Corners

There has also been a marked tendency to reduce the cost of articles manufactured from steel products by buying a cheaper grade of material than that which really ought to be used. Economic production is of course to be commended, but the manufacturing customer should not expect to get as good results from the use of improper material as he would get if he used the proper grade.

For instance, in our line some customers are now using common one pass cold-rolled sheets, whereas, formerly, they used patent leveled sheets. And they expect these common sheets to be perfectly flat. Others are now using refined sheets who formerly used pickled sheets, and they expect to get these refined sheets free from scale. Then there are others who use single pickled sheets who formerly used full pickled sheets, and they seem to expect to get as good surface. Some customers expect to get a full pickled finished sheet that is absolutely perfect on both sides. This, of course, is a manufacturing impossibility. Some customers who formerly bought a high grade product for finish and color now use common steam-blued sheets and expect as uniform color and good surface as in the more expensive grade.

Complaints are often due to the fact that salesmen do not ascertain the essential requirements of the customer, and for this reason it sometimes happens that unsuitable material is shipped. Salesmen should obtain the necessary information in regard to the requirements of the customer and these features should be noted on the order, so that the mill people may know just what is required and be governed accordingly. It is just as important to avoid causes for claims as it is to settle them.

Adjustments Should Be Based on Equity

In the settlement of claims it should be the policy of the claim agent to accord the customer prompt, just and fair treatment. The claim agent should always try to conserve the customer's interest just as faithfully as he does that of his company, for he should appreciate the loyalty of a satisfied buyer.

The claim agent should not try to see how cheaply he can settle a claim, but how justly. Complaints should be thoroughly investigated, not only to ascertain what merit they may have but to learn the cause of the trouble, so that steps may be taken to avoid their recurrence, if possible.

Claims should not be settled upon a hair-splitting basis. The claim agent should be broad and liberal. Claims should not be settled on a guessing basis of loss, for the reason that such settlements are not fair to either the buyer or the seller. If a customer should get the better of a settlement when the amount is guessed at, he would probably prefer to make such settlements in the future. If he should get the worst of it, then he would not feel satisfied. No settlement is a good one that leaves the customer dissatisfied.

When a customer innocently orders improper material for a certain purpose and runs into trouble, he should assume the loss. But his loss should be reduced by the seller in any way that seems feasible, and the customer should be educated as to the kind of material he should order in the future. When a customer knowingly orders a cheaper grade in substitution for the proper grade, he should be held strictly accountable to the liability thus incurred.

As a rule, manufacturers of steel products do not allow labor charges. In fact, such material is usually sold with the distinct understanding in the formal contract of sale that the manufacturer shall be exempt from such liability, as well as for damages of a consequential nature. And yet customers will often present claims for labor charges and consequential damage and think the claim man narrow, un-

fair and arbitrary, because he refuses to do the very thing which they formally agreed his company would not be asked to do. The claim agent should always defend manufacturing rules and principles.

Some Details of Procedure

The file record should always show that the next move is up to the customer. If the case has had attention and he lets the matter drop, the claim should be taken from the current files and put in the disposed cases.

It should be the practice of the claim agent to make a report each month to the executive, operating and sales departments, giving an alphabetical list of customers to whom claims have been allowed and the amounts. These reports should give the grade of material, the nature of the complaint, and the name of the mill at which the material was made. He should make a report each month to the sales manager of each district sales office of claims allowed to customers in his territory. This report should give full particulars. He should also make a report each month to the operating department, showing all claims allowed against the various products of each mill; and to the manager of each mill, showing full particulars of all claims allowed against his mill. He should also have a card system showing at all times the amount allowed various customers, as well as the amount allowed against the various products.

These reports will suggest to the manufacturing department corrective measures which may remove causes for complaints, if the fault is due to mill practice.

Conclusion

In conclusion, I want to correct an impression that is somewhat prevalent among some customers; namely, that the claim agent is working only for the interest of his company and that he is not particularly concerned regarding the losses and troubles of the customer, when material proves unsatisfactory. While such an impression might reflect the attitude of the customer if he were the claim man, yet it does not reflect that of an efficient claim agent. While the claim man should endeavor to save his company from all unnecessary losses, yet he should see to it that it bears cheerfully all losses that are properly chargeable to it. The claim man should be broad-gauged enough to see each complaint not only from his point of view but from the viewpoint of the customer, and to handle it in such a way as to conserve the interests of all concerned.

The claim man is always in the center of conflicting interests and opposing opinions. He is the buffer between the customer, the sales department, the operating department, and the mill. In handling claims it is of course impossible at all times to please everybody, no matter how hard one may try to do it. But there is much gratification, however, in the consciousness of having tried faithfully to do your duty.

Active operations in the making of coke are progressing in the Greene County district of the Lower Connellsville coke region. The Poland Coke Company, which is building a plant of 100 ovens on Dunkard Creek near the Monongahela River, has 50 ovens completed and has begun to ship coke. Julian Kennedy, of Pittsburgh, is at the head of the company. The Reliance Coal & Coke Company is building a plant of 400 ovens at Denbo, below Brownsville, and will soon begin shipping. The Luzerne Coal & Coke Company, in which the J. H. Hillman & Sons Company, of Pittsburgh, and others are interested, has completed its plant at East Millsboro, consisting of 34 ovens.

"Fuel Costs" is the title of a pamphlet issued by Tate, Jones & Co., Inc., Empire Building, Pittsburgh, Pa., in which a comparison is presented of the cost of burning fuel oil, producer gas, natural gas and powdered coal in furnace work. The conclusion is drawn that the present user of fuel oil who becomes alarmed at the increases in the price of oil should figure out his conditions carefully before deciding against its use; by comparison with other fuels, "he can pay a good deal more for oil than he thinks and still have the fuel cost per unit of product at a satisfactory point."

Transportation on the Great Lakes*

Increased Lake Freight Movement Since the Steel Corporation was Formed—Looks for Great Expansion in the Future

BY HARRY COULBY †

Statistics are always dry reading, but I know of no better way to illustrate graphically the wonderful growth of commerce on the Great Lakes than by comparing the tonnage of 1901 (the year the United States Steel Corporation was formed) with that of 1912, a period of 12 years.

Some Suggestive Comparisons

In 1901 the total movement of iron ore on the Great Lakes was 20,157,000 gross tons, and in 1912 it was 47,435,000 gross tons. In this connection I call your attention to one significant fact, namely, that the percentage of the total movement of the Steel Corporation for its own use was 10 per cent. less in 1912 than in 1901, demonstrating very clearly that, even with the large expenditures made by the corporation at Gary and other plants, the other consuming interests of Lake ore have grown more rapidly than the Steel Corporation.

The movement of bituminous coal on the Lakes in 1901 was 6,533,000 tons. In 1912 it was 23,336,000 tons. Last year the movement of grain was 485,000,000 bushels, as compared with 255,000,000 bushels five years ago. The total amount of freight moved through the Detroit River last year was about 95,000,000 tons. In 1901 the average Lake freight on iron ore from the head of Lake Superior to Lake Erie ports was 80 cents per gross ton; in 1912 it was 50 cents per gross ton. In 1901 the largest single cargo carried on the Great Lakes was 8222 tons; in 1912 the record single cargo, carried by the steamer Col. J. M. Schoonmaker, was 13,511 tons. In 1901 the total value of freight moved through the Sault Canal was estimated at \$298,000,000, as against \$791,000,000 in 1912.

Improvements in Terminal Facilities and Ships

It is estimated that the movement of iron on the Great Lakes this year will exceed 50,000,000 gross tons, or a 150 per cent. increase over the movement of 1901. Bear in mind that the season of navigation on the Lakes does not exceed an average of 240 days, or about 200 working days at the loading and unloading docks. This will require 250,000 tons of ore to be handled every working day in and out of the ships during the season of navigation.

The terminal companies have been equal to the demands made upon them. When I first became connected with the business about a quarter of a century ago the ore was loaded into tubs in the hold of the vessel, hoisted up on a staging with a small engine, dumped into barrows and wheeled into cars, and the task of discharging the largest ship then engaged in the trade, carrying about 2000 tons, was satisfactorily performed if accomplished in a week's time. Today the record for unloading is 10,636 gross tons taken out of the hold of a ship and put into cars in two hours and fifty minutes. The modern unloading machine is indeed a marvel in engineering skill. It is electrically operated, and each unit is capable of transferring ore from the hold of a vessel into cars at the rate of 400 or 500 tons per hour without the necessity of any manual labor in shoveling the ore. Here we have a striking illustration of the elimination of manual labor, as in the early days every pound had to be shoveled by hand. Until this type of unloading machine was adopted 50 men were required to do the shoveling necessary to unload a 2000-ton cargo in a day.

The new ships that are being built for this trade are about 600 ft. long, 58 ft. wide and 32 ft. deep, built under the arch construction plan, with double sides, triple expansion engines of about 2000 indicated hp, with an average speed of 11 miles per hour, and burning about a

ton and a half of coal per hour. In 1912 the greatest amount of freight carried by one single steamer was 874,000 tons, and the greatest number of miles run by one steamer was 46,835.

If the estimated movement of ore during the present season of navigation is accomplished it will require a weekly movement of iron ore, coal and limestone through the office of the Pittsburgh Steamship Company (the Lake arm of the United States Steel Corporation) of over 1,000,000 tons.

Value of Co-operation

The ease and regularity with which Lake commerce is handled are due to the spirit of hearty co-operation that exists between those engaged in this business. I know of no greater exemplification of what can be accomplished by co-operation and team work. We are working along the same lines as this Institute. Every winter we have a convention attended by representatives of the mining companies, the railroads and terminal companies, the captains and management of the ships, government officials in charge of the canals and aids to navigation, and matters are discussed pertaining to the business. These men get better acquainted with each other and talk over the difficulties that occur in their part of the work; reports of delays and interruptions to the business are made and discussed; and all join together in formulating ways and means to avoid delays and keep the tonnage moving. The question of safety to life and property is also given very serious consideration, and committees are formed to watch carefully at all times and make suggestions for the elimination of accidents. We are indebted to the Welfare Committee of this Institute for some very valuable suggestions which we find applicable to our business. I know that the results of these yearly conventions are the most important contribution to the development of the business from an economic standpoint.

As to the Future

Now, as to the future. The chain of the Great Lakes is the greatest inland waterway in the world. It extends a thousand miles from Buffalo in a northwesterly direction, and about the same distance through the Straits of Mackinaw to Chicago, with only three places in the entire distance where channels have had to be widened and deepened—that is, through the Detroit and St. Clair rivers and through the St. Mary's River. All the balance of the way is practically an open sea on which the largest ships afloat can navigate. The center of population is constantly moving westward and our needs are becoming greater every year.

Estimates have been made of the amount of ore that is available in the Lake Superior district, but with new developments each year and the necessity of using the leaner ores I do not believe there is any man living who can make an estimate that is worth anything of the available tonnage of ore that will eventually be brought down from the district before the ore bodies are exhausted. The other day I was speaking with a practical mining man who had spent his whole life in the iron mines of the Lake Superior region, and it was his opinion that on the older ranges there would be large tonnages of ore found at greater depth. No estimate has been made of the tonnage of what is called low-grade ore that would not become marketable until some of the richer ores are exhausted, but the known area of the ore-bearing formation of this so-called low-grade material is very large and it will eventually come into its own.

The Growth of Lake Commerce Will Continue

I believe the growth of Lake commerce will be just as great during the next 25 years as it has been in the past.

*Read before the American Iron and Steel Institute, New York, May 23.

†President Pittsburgh Steamship Company, Cleveland, Ohio.

The country tributary to Lake Superior is rapidly becoming populated and new business for water transportation is springing up every year. Large bodies of limestone have been found in the Alpena district on Lake Huron, and this material is now being shipped as far east as Buffalo and also to Chicago and Duluth. The Dominion of Canada is very rapidly contributing to our Lake commerce. The northwestern provinces of Manitoba, Saskatchewan and Alberta in 1900 produced 43,250,000 bushels of grain. In 1912 their production was 453,000,000 bushels, and it is today taxing the railroads to their utmost limit to get this product to the consumer. In fact, in 1911 and 1912 some of this grain was spoiled on account of lack of railroad facilities to transport it. The nearest and cheapest way to get this grain to the consumer is via the Great Lakes to Buffalo, and thence by rail to the seaboard for export.

Lake Erie and Lake Ontario are connected by a system of locks in the Welland Canal. These locks will not accommodate a boat longer than about 265 ft., on a 14 ft. draft, which restricts commerce to Lake Ontario to boats of this size. Appreciating the necessity of clearing away this obstruction, the Dominion Government has, I understand, appropriated \$200,000 for a preliminary survey for a contemplated improvement to cost \$50,000,000, with which it is proposed to straighten and deepen the Welland Canal, reduce the number of locks from 25 to 7, and give 30 ft. of water for navigation through the canal available for ships 300 ft. long and 80 ft. wide. Our own Government, with great forethought, has realized that every dollar spent in widening and deepening these channels connecting the Great Lakes brings the producer and consumer just that much closer together. And I firmly believe that in years to come either our own Government or the Dominion Government, or probably both working together, will carry on the work of deepening the channels connecting Lake Erie with Lake Ontario, and Lake Ontario with the Atlantic Ocean, until the day will arrive when ships will load grain at the northwest end of Lake Superior and carry their cargoes to the markets of the Eastern hemisphere.

Judicial Decisions of Interest to Manufacturers

ABSTRACTED BY A. L. H. STREET

WARRANTY OF MACHINERY SOLD.—A clause, "boiler guaranteed free from defects for one year," written on a printed billhead at the time of a sale, nullifies two printed clauses, "no special warranty," and "no claims for labor or damages will be allowed." Wages paid employees while awaiting the arrival of a new boiler, rent of factory while shut down, and loss of an order which had to be canceled, are recoverable as damages for breach of warranty under which the boiler was sold. (New York Supreme Court, Westchester Trial Term, Deniville Company vs. Leonard Keil, Inc., 140 New York Supplement 150.)

CARRIER'S DUTY CONCERNING FREIGHT.—When the consignee of freight refuses to receive it, the carrying railroad company is bound to notify the shipper promptly. If the shipper does not specify a route, the receiving carrier is at liberty to choose any available route, but must act in good faith to avoid any loss to the shipper on account of the choice made. (Georgia Supreme Court, Alabama Great Southern Railroad Company vs. McKenzie, 77 South-eastern Reporter 647.)

INJURY TO EMPLOYEE CAUSED BY FLYING PARTICLES.—An employee assumes the risk of being struck in the eye by a piece of a rivet head while chipping the head off with a chisel, and cannot recover for such an injury where doubt exists as to whether the piece of metal came from the chisel or the rivet. (Missouri Supreme Court, Modlage vs. Kaysing Iron & Foundry Company, 154 Southwestern Reporter 752.)

EMPLOYER'S DUTY AS TO ELEVATORS.—An employer is not held to the high degree of care for the safety of employees while riding on an elevator that is required as to ordinary passengers on elevators; the duty as to workmen being merely to use that degree of care which a person of ordinary prudence would use in the same circumstances. (Oregon Supreme Court, Putnam vs. Pacific Monthly Company, 130 Pacific Reporter 986.)

INJURY CAUSED BY DEFECTIVE CRANE.—Plaintiff was a machine operative in defendant's manufacturing plant. Running the length of the building, and over the place plaintiff worked, were two parallel, suspended rails, forming the track for a small overhead crane. Previous to

the accident these tracks became so spread as to permit the crane to fall between them and upon plaintiff. Held, that if defendant was negligent in failing to properly maintain the tracks, and such negligence contributed to the accident, it was not relieved from liability to plaintiff because a fellow employee negligently started the crane. (United States Circuit Court of Appeals, Third Circuit, Kocais vs. American Car & Foundry Company, 201 Federal Reporter 913.)

BOILER AS PART OF LAND SOLD.—If a purchaser of land knows that a boiler on the premises does not belong to the grantor, and that it has been agreed between the seller of the land and another that it belongs to such other person, it does not pass under the deed, though there is no reservation of title to the boiler in the deed. (Missouri Court of Appeals, Muehling vs. Magee, 153 Southwestern Reporter 787.)

RIGHTS OF PREFERRED STOCKHOLDERS.—Where a corporation's charter provides that preferred stock shall receive interest or dividends of 8 per cent. per annum and be preferred as to capital as well as to dividends, preferred stockholders who have received their dividends have no interest in surplus profits which have been allowed to accumulate. Such earnings belong to the common stockholders and may be distributed among them as cash dividends or in the form of stock dividends. (United States Circuit Court of Appeals, Second Circuit, Niles vs. Ludlow Valve Mfg. Company, 202 Federal Reporter 141.)

PATENTABILITY OF DEVICES.—Transposition of parts in an existing device constitutes patentable invention, if they co-act in a different manner and produce a new result. (United States Circuit Court of Appeals, Sixth Circuit, Grever vs. United States Hoffman Company, 202 Federal Reporter 923.) But a device which does substantially the same thing as a prior device, in substantially the same way, is not patentable though it produces better results. (United States District Court, Southern District of New York, Archer vs. Imperial Machine Company, 202 Federal Reporter 902.)

RISKS ASSUMED BY MACHINE OPERATOR.—Where a device on a machine was removed to facilitate its operation, and the operator did not complain against such removal, he assumed the risk of being injured through absence of the device. (New York Supreme Court, Second Appellate Division, Wistinetz vs. Goldman, 139 New York Supplement 402.)

PROOF OF NEGLIGENCE IN PERSONAL INJURY ACTIONS.—In an employee's personal injury action, he is not entitled to show precautions taken after his injury to prevent recurrence of similar accidents, as an implied admission on the part of his employer that proper precautions for his safety were not previously taken. (Oklahoma Supreme Court, Sloan vs. Warrenburg, 129 Pacific Reporter 720.)

INJURY FROM FLYING PARTICLES OF STEEL.—An employer is liable for injury to a machine shop employee who was rendered blind by flying particles of steel, caused by a foreman striking a steel shaft which he directed the injured workman to hold. (New York Supreme Court, Second Appellate Division, Cashmore vs. Peerless Motor Car Company, 139 New York Supplement 359.)

BROKER'S RIGHT TO COMMISSION.—A broker's right to a commission for negotiating a contract for a sale of a quantity of pig iron is not affected by the fact that his principal was compelled to sue the buyer in order to enforce the contract, nor by the fact that the broker knew that the buyer did not intend to comply with his agreement. (Georgia Court of Appeals, Georgia Iron & Coal Company vs. Rogers, Brown & Co., 77 Southeastern Reporter 213.)

VALIDITY OF RELEASE EXECUTED ON SUNDAY.—An employee's release of claim for personal injury is not invalid because executed on Sunday, if the amount paid him in consideration of the release was not paid until a later and secular day. (Kentucky Court of Appeals, Ross vs. Oliver Brothers & Honeycutt, 153 Southwestern Reporter 756.)

BUYER'S FAILURE TO RECEIVE SPECIALLY MANUFACTURED ARTICLES.—To entitle a manufacturer to recover more than nominal damages for a buyer's refusal to receive goods specially manufactured for him, it must appear that there was no market on which the manufacturer could have protected himself by selling the goods elsewhere. (New York Court of Appeals, Thomas Gordon Malting Company vs. Bartels Brewing Company, 100 Northeastern Reporter 461.)

MANUFACTURER'S RIGHT AGAINST RETAILER AS TO PRICES.—A retail dealer's agreement with a jobber or wholesale dealer to sell at fixed prices, for the benefit of the manufacturer from whom the jobber or wholesaler purchased on such condition, is enforceable by the manufacturer against the retailer directly. (California Supreme Court, D. Ghirardelli Company vs. Hunsicker, 128 Pacific Reporter 1041.)

The Machinery Markets

In the past few days there has been a little betterment in demand in several cities, but conditions generally continue more quiet than otherwise. In New York buying drags but the trade is cheered by purchases of the Pennsylvania Railroad and prospective buying by other railroads and the Government. In Philadelphia activity has been mostly in orders for single tools; May was irregular and there is some anxiety over threatened labor troubles in the gray iron foundries. In New England business picked up in the last two weeks of May and the electrical industry in particular is busy. Cleveland machinery dealers report a slight improvement over the previous week and plants and foundries are busy, but new orders are coming along slowly as a rule. The railroads are buying quietly in Cincinnati, where the export business is reported to be quiet. Demand in Milwaukee is quiet for heavy machinery and power equipment but otherwise trade is satisfactory despite increased conservatism. Trade has been spotty in Detroit, though the aggregate of sales in May were equal to those in April and the movement of standard machine tools has been a cause of satisfaction. The Central South reports more activity in power equipment, while woodworking and sawmill machinery has been selling well. In St. Louis where deliveries are being made to the Busch-Sulzer Bros.-Diesel Engine Company, trade is reported to be fairly satisfactory. The demand for machine tools fell off in Birmingham in May, but was still above the average and the call for boilers and engines continued steady. On the Pacific coast the aggregate of sales, mostly for replacement, was fairly satisfactory, with electrical installations in lumber mills a good source of business.

New York

NEW YORK, June 4, 1913.

The distribution of orders by the Pennsylvania Railroad against its large list of requirements is the one really pleasing bit of activity in the local market. Almost without exception dealers and manufacturers' salesmen find conditions quiet, although in some cases the last week or ten days brought a little improvement. The Delaware, Lackawanna & Western Railroad has not bought against its recently published list, but it is expected that action by this road as well as by the Norfolk & Western Railway will not be long delayed, while the Pennsylvania Railroad undoubtedly will continue to buy in this and other cities. Fair sales of second-hand machinery are being made. Prospective Government purchases for Pearl Harbor, Hawaii, and other navy yards have continued to absorb attention from the trade.

The following orders for cranes have been received by the Alliance Machine Company through its New York office: One 30-ton 4-motor crane for the General Electric Company, West Lynn, Mass.; one 25-ton four-girder double trolley ladle crane for the Orford Works of the International Nickel Company, and the following cranes for the Lehigh plant of the Bethlehem Steel Company: One 40-ton of 84 ft. span, two 15-ton, four 10-ton, five 5-ton, three motor mill type.

The Barlow Foundry Company, 28 Orange street, Newark, N. J., A. E. Barlow, president, has completed plans for a new plant to occupy an entire block on New Jersey Railroad avenue, between Alpine and Hunter streets, extending back to Avenue A. Work will be started at once on three one-story buildings to cost approximately \$50,000. They will consist of a malleable iron foundry, 70 x 280 ft.; gray iron foundry, 60 x 180 ft., and a connecting building, 100 x 200 ft. for miscellaneous purposes, including offices. All of the buildings are to be of fireproof construction and special consideration has been given to ventilation, lighting and general equipment in accordance with plans prepared by Walter Kidde, New York.

The Dilts Machine Works, Inc., Fulton, N. Y., has been incorporated for \$125,000 by F. B. Dilts, 145 South First street, F. L. Flanders and B. W. Bennett, all of Fulton. A plant will be built and equipped.

The Carthage Machine Company, Carthage, N. Y., A. F. Wardwell, manager, is having plans prepared for a machine shop addition 50x60 ft., 2 stories.

The Rochester Railway and Light Company, Rochester, N. Y., will build an addition to its shops and power plant at the foot of South Water street. The power station building will be 40x100 ft. Two water wheels and dynamos will be installed, one dynamo having a capacity of 2700 h. p. and the other 5300 h. p.

The Rochester Can Company, Rochester, N. Y., has filed plans for a one-story addition 46x150 ft., which it will make to its factory on Hague street.

The firm of E. R. Caldwell & Son has been organized at Syracuse, N. Y., and will build and equip a foundry plant for the manufacture of brass, bronze and silver metal castings. Mr. E. R. Caldwell was formerly

president of the Caldwell & Ward Brass Company. He has sold his interest in that concern to his partner, P. B. Ward.

The Cataract Power & Conduit Company, Buffalo, has let a contract for an addition to its transformer building, at Niagara and Front streets, to cost \$25,000.

Ralph Croshier, manufacturer of patent adjustable bits, Wappinger Falls, N. Y., is equipping a new machine shop on West Main street.

The Art Silk Yarn Company, Kingston, N. Y., is nearly ready to take bids on the mill and factory buildings it is to erect in that city. There will be 17 one-story buildings, which will occupy a site 225x338 ft. B. W. Wilkins, 38 East 25th street, is the president of the company.

Plans for the enlargement of the municipal water works, Boonville, N. Y., are being prepared by W. G. Stone, engineer, Mann Building, Utica, N. Y. The added construction will include concrete dam, gate house, piping and valves. Geo. O. Bridgeman, Boonville, is superintendent.

The Lumen Bearing Company, Buffalo, is having plans prepared for a new brass foundry building to replace buildings recently destroyed by fire. W. H. Barr is general manager.

The Cordova Shops, Inc., Buffalo, has been incorporated with a capital stock of \$175,000. The company will engage in the manufacture of leather and metal art goods, etc. The directors are Wilbur F. S. Lake, Buffalo; Otto Hilt, Kenmore, N. Y., and Frederick C. Kranz, East Aurora, N. Y.

The Automatic Transportation Company, Buffalo, is completing plans for a one and two-story addition to its factory at Main street and the Erie Railroad belt line, which it will build this spring.

The Corrugated Bar Company is completing a crane runway extension to its warehouse at South Buffalo, giving 2,000 tons additional stock capacity of corrugated bars, and making a total warehouse capacity of 6000 tons. Plans are in progress for other additions to the company's corrugated bar plant at South Buffalo. A. L. Johnson, Mutual Life Building, Buffalo, is first vice-president.

The Fairsimon Glue Company, Buffalo, N. Y., has been incorporated by Henry J. Simons, 40 Fargo avenue, and Edward J. and Howard Fairbairn. The company will equip a plant for the manufacture of waterproof papers.

The Atlas Steel Casting Company, Buffalo, has increased its capital stock from \$125,000 to \$150,000 to provide for the enlargement of its plant at Elmwood avenue and the Erie railroad.

The Larkin Company, Buffalo, manufacturers of premium soaps, perfumery, etc., will build an eight-story concrete factory at 614-618 Carroll street to cost \$100,000.

The Fahnstock Manufacturing Company, Philadelphia, have let a contract to Morris & Allan, Buffalo, for erection of a three-story brick factory building 60x140 ft. to cost \$35,000, to be erected at Payne avenue and the Erie railroad, North Tonawanda, N. Y., for the manufacture of chocolate and confectionery.

New England

Boston, Mass., June 3, 1913.

From various sources comes the statement that while the first half of May developed a sharp falling off in orders for machinery, the last two weeks brought a goodly volume of business. The manufacturers of electric motors of capacities demanded for machine tool purposes probably have never been so busy; in fact the electrical industry continues a consistent buyer of equipment. It is a safe statement that production of manufactured goods is fully up to normal.

Boston is rejoicing in the opening of the great Commonwealth pier, with the beginning of a new European service, that of the Hamburg-American line.

The Putnam Foundry & Machine Company, Putnam, Conn., manufacturer of heating apparatus, has elected a practically new board of directors consisting of Edward Mullan, L. E. Smith, G. Harold Gilpatrick, Samuel Reynolds and Frank G. Letters, all of Putnam; George M. Sampson, Woodstock, Conn., and R. F. Gardner, Jr., Providence, R. I. Mr. Mullan is the only member of the old board.

The Naugatuck Valley, with its vast brass interests, is usually considered a good business barometer. The mills are rushing at full capacity and so are the factories which cut up brass for multitudinous purposes. A significant fact is that the builders of machinery entering into the industry are rushed with orders, which are still received in satisfactory volume. Rolling and wire-drawing machinery, presses, headers, thread rolling machines and the others which are included in the product of these shops, are inactive demand from those who are preparing for a future market.

The Fitchburg Machine Works, Fitchburg, Mass., has acquired the business of the Flanders Mfg. Company, Chelsea, Mich., formerly the Grant & Wood Company, manufacturer of automatic screw machines, and will create this new department of its works at Fitchburg, manufacturing the machinery and screw machine products. The factory building formerly occupied by the Becker Milling Machine Company has been acquired for this branch of the business.

The Hartford Drop Forge Company, Hartford, Conn., will establish works in that city on Windsor avenue. The incorporators are Charles F. Dickinson, Hartford, president and treasurer; Albert W. Johnson, West Hartford, vice-president; Earl C. Abbe, Windsor, secretary. The company is incorporated under Connecticut laws, with \$50,000 authorized capital stock, and begins business with \$6000.

The Hartford Realty Company, Hartford, Conn., has converted a factory on Capitol avenue into a modern industrial building, which will be rented for manufacturing. The structure is 85x100 ft., two stories, and is designed to receive two additional stories later.

The Belknap Manufacturing Company, Bridgeport, Conn., manufacturer of fittings, has purchased a site for new works in that city on Holland avenue and will erect a three-story building, 50x320 ft., of brick, mill construction.

The State Trade School, New Britain, Conn., plans to erect and equip an iron foundry, if an appropriation now before the Legislature becomes available.

In addition to enlargements already announced the New Britain Machine Company, New Britain, Conn., will add three stories to an existing building.

Additions to general manufacturing facilities in New England include the following: Builders' Finish Company, Worcester, Mass., mill building at Barbers Crossing, to cost \$20,000; Chelmsford Spring Company, Chelmsford, Mass., plant to replace that recently destroyed by fire; Brown-Durrell Company, Boston, mill building, 100x100 ft., Framingham, Mass.; Linde Air Products Company, Cleveland, Ohio, manufacturer of oxygen products, branch works at Worcester, Mass.; American Casket Company, factory at Springfield, Mass.; Bristol Mfg. Company, Bristol, Conn., additional brick factory, 40x60 ft., three stories; A. G. Spalding & Bros. Mfg. Company, Chicopee, Mass., sporting goods, addition, 60x210 ft., four stories; Standard Woven Fabric Company, Worcester, Mass., three-story mill, 53x210 ft., at Framingham, Mass.

The Connecticut Manufacturers' Association has sent to Washington an exceedingly comprehensive brief covering the various schedules of the tariff bill as it affects the industries of the State. Included in this brief, and in others privately filed, are protests from the Capewell Horse Nail Company, Hartford; the various manufacturers of shears; Ball & Socket Mfg. Company, West Cheshire; Traut & Hine Mfg. Company, New Britain, metal specialties; Corbin Screw Company, the Stanley Works and Landers.

Frery & Clark, New Britain; New Haven Clock Company and Winchester Repeating Arms Company, New Haven; American Tube & Stamping Company and Union Metallic Cartridge Company, Bridgeport; New Departure Mfg. Company, Bristol; Hopkins & Allen Mfg. Company, Norwich, firearms; Sessions Clock Company, Forestville; Gilbert Clock Company, Winsted; American Buckle Company, West Haven; Standard Mfg. Company, Torrington; Yale & Towne Mfg. Company, Stamford.

Philadelphia

PHILADELPHIA, PA., June 2, 1913.

Sales of machine tools have been mostly single tool propositions, while new inquiries for any sizable equipment develop but slowly. Labor uncertainties in a few lines have some influence on the market, while tariff matters add to the perplexities of the situation. Business during May showed irregularity; some reporting a fair, others a dull month. Some few orders have developed from the railroads, generally against inquiries put out some time ago. Little if any business has been placed in connection with the recent Pennsylvania Railroad inquiries. A good run of business in small power plant equipment in connection with general manufacturing building continues to develop. Several general mechanical equipment propositions for office buildings are about to come out. A fair amount of business is moving in second hand machinery. The foundry trade is active but is somewhat upset by threatened labor troubles in the gray iron branch. Steel casting plants are quite busy.

While the contract for the new office building of the Penn Mutual Life Insurance Company at Sixth and Walnut streets, has been awarded to Doyle & Co., those for the power plant and mechanical equipment have not yet been considered. The building will be 92 x 210 ft., seven stories, with elevators and steam heat. E. V. Seeler, Real Estate Trust Building, is the architect and engineer.

The power plant equipment, including boiler, engine, pumps, etc., elevators, steam heating, etc., in connection with a new apartment house, from plans by H. L. Reinhold at Spruce and Watts streets to be erected by J. G. Dook & Co., for Mrs. T. G. Barlow, have not yet been fully decided upon but expects to be taken up by the architect in the near future.

Ballinger & Perrot, engineers, have in course of preparation plans for a four story modern baking plant to be erected for the James Bell Company, at Allegheny avenue, Lippincott, Master and Hancock streets. The building will be 210 x 225 ft. and supplied with power apparatus as well as the latest mechanical equipment. Plans are expected to be completed in about 30 days.

Contractors are figuring on the cost of erection of a five story brick and concrete manufacturing building, 60 x 100 ft., to be built for the Joseph Bancroft & Sons Company, Wilmington, Del. Power plant and elevators are included.

Irwin & Leighton have been awarded the contract for the erection of a four-story brick, steel and concrete factory building, 275 x 350 ft., for the Tice Decorating Company, Baltimore, Md., from plans by Theodore W. Pietsch. The power plant and mechanical equipment will be placed under a separate contract.

John G. Brown is preparing plans, it is reported, for a one-story brick, concrete and steel power house and coal pit to be erected at Nineteenth street and Allegheny avenue for the Electric Storage Battery Company.

The Roydhouse-Arey Company has been awarded a contract for a reinforced concrete round house 90 x 225 ft. and for a concrete machine shop 65 x 100 ft. to be erected for the Pennsylvania Railroad at Morrisville, N. J., from plans by its own engineers.

Chicago

CHICAGO, ILL., June 2, 1913.

The Hallet Iron Works, Polk street, Chicago, has plans for a one-story foundry, 60x162 ft., to be erected at Harvey, Ill., at a cost of about \$15,000.

The W. W. Wilcox Company, 443 South Dearborn street, Chicago, has taken out a building permit for its new factory at 1721 Armitage avenue, which provides for a one-story brick building, 125x177 ft., at a cost of \$25,000. The company manufactures metal stampings.

The Hoopeston Gas Engine Mfg. Company is to be the corporate name under which a new enterprise will be organized at Hoopeston, Ill., to build a factory and manufacture gas engines.

Chas. H. Besly & Co., Chicago, has had plans prepared for the proposed extension of its Beloit plant providing for a two and three-story factory, 70x255 ft., to cost \$70,000.

The Pyott Foundry Company, Chicago, has purchased a block of land on West Lake street in that city and plans are understood to be in progress for the building of a new plant.

The Atchison, Topeka & Santa Fe Railroad has placed a contract for the erection of a 10-stall round-house and boiler house at Wichita, Kansas, the cost of which will be \$23,000.

The Kottusch Patent Pulley Manufacturing Company, 127 North Dearborn street, Chicago, has arranged for the building of a new factory for the manufacture of power transmission machinery at East Gary, Ind. The company is capitalized for \$75,000. E. Kottusch is president and E. Taubner is secretary.

The Aurora Metal Works, Aurora, Ill., manufacturer of railroad supplies, including car brasses and other brass appliances, was damaged by a \$10,000 fire May 23.

The Challenge Mfg. Company, Ottawa, Ill., will be incorporated with a capital of \$20,000 to manufacture a patented elevator device. C. L. Aygarn, Seneca, Ill., is the patentee.

Behler & Cox, Grand Rapids, Mich., are building a one-story brick and concrete factory, 50x100 ft., for manufacturing sheet metal products.

W. R. Myers, Bartlesville, Okla., manufacturer of the Little Giant pulling machine, is building an extension to his shop.

gasoline vending machines, has secured a factory and will proceed at once with the installation of the necessary equipment.

Indianapolis

INDIANAPOLIS, IND., June 3, 1913.

The contract for the new factory buildings of the Lincoln Chair Company, Columbus, Ind., has been let to Hege & Co. at \$20,000. The main building is to be of brick, two stories.

The Allegheny Gas Company, Marion, Ind., has been incorporated with \$50,000 capital stock to drill gas and oil wells in Indiana. The directors are B. F. Burk, G. S. Condo and J. R. Browne.

The Cole Motor Car Company, Indianapolis, manufacturer of automobiles, has increased its capital stock from \$500,000 to \$1,000,000.

The Dice Engine Company, Anderson, Ind., has been organized and incorporated with \$50,000 capital stock to manufacture motors and engines. The directors are E. F. Dice, H. P. Fisher and J. Podmore.

The People's Light & Heat Company, the Merchants' Heat & Light Company, the Merchants' Public Utility Company and the American Public Utilities Company, Indianapolis, have asked permission from the public service commission of the State to merge.

B. F. Lambert, president Buckeye Mfg. Company, Anderson, Ind., manufacturer of automobiles, has acquired a controlling interest in the Elwood Iron Works, Elwood, Ind. The latter has a contract to build the Morrison crude oil engine. The company also supplies all heavy castings for the American Rotary Valve Company, Anderson.

Detroit

DETROIT, MICH., June 2, 1913.

May was what might be termed an in-and-out month in the machine tool trade; or in other words, business was good only in spots. The aggregate volume of business reported was, however, at least equal to that of April, and on account of the larger volume of standard tool buying, perhaps more satisfactory. Practically all of the trade reports the last week's business to have been rather colorless with only a moderate amount of orders coming out and these mostly for single tools. The only railroad requirement which is being looked forward to in this district is the equipment for the additions to shops of the Michigan Central at Jackson. Labor troubles have developed during the week, which are causing considerable uneasiness, the most important being the strike of the electrical workers in power plants at Muskegon, Grand Rapids and other west Michigan cities, and the walkout of the boilermakers and machinists in the shops of the Pere Marquette Railroad.

The Grant Motor Company, Detroit, has been organized and will begin the manufacture of automobiles as soon as arrangements for a factory can be completed. Among those interested in the new company are George D. and Charles A. Grant, David Shaw and George F. Salzman.

The Detroit United Railways, Detroit, has awarded the contract for the erection of a large new shop in connection with its Highland Park car barns.

The Diamond Brass Works, Detroit, has been incorporated with a capital stock of \$10,000 to manufacture brass and other metal goods. E. J. Shaw and W. L. Abate are the principal stockholders.

The Anguish Mfg. Company, Detroit, has been incorporated to engage in the general metal stamping business and to manufacture automobile radiators. J. M. Anguish, C. H. Talbot and F. C. Arthur are the incorporators. The new company has acquired the plant and machinery of the Farlinger Mfg. Company, 1506 Fort Street, so that little new equipment will be required at present.

The Brass Products Company, Detroit, has increased its capital stock from \$6000 to \$15,000.

The Trojan Laundry Company, Detroit, whose building was recently burned, will erect a new plant at once, to be 87 x 97 ft., three stories and of heavy mill construction. New equipment will be installed.

The Barnes Mfg. Company, Grand Rapids, Mich., has been incorporated with \$30,000 capital stock to manufacture vacuum cleaners and other devices. I. W. Barnhart, E. M. Barnes and W. J. Fuller are the incorporators.

The Haight Mfg. Company, Lansing, Mich., recently organized for the purpose of manufacturing automatic

Milwaukee

MILWAUKEE, WIS., June 2, 1913.

Outside of the somewhat stagnant tone of the heavy machinery and power equipment market, the general situation is satisfactory and gives promise of so continuing. Machine tool business, naturally, is setting the pace for manufacturers in the Milwaukee district. Plants which specialize in special jobs are hardly able to keep up with orders. Second-hand business in all lines is brisk, due to bargains to be had as the result of continual replacements made by some of the large manufacturing plants in Milwaukee as improvements are made to gain efficiency and economy. There is still a feeling of uncertainty which results in but one thing—conservatism.

The Harris Typewriter Company, Fond du Lac, Wis., has been reorganized, following the conclusion of insolvency proceedings by the bondholders, and a new corporation organized under the same style. The capital is \$1,500,000 as compared with \$365,000 of the old concern. Fred J. Rueping, T. L. Doyle and W. H. Rueping appear as incorporators. Representatives of the bondholders bid in the real and personal property at \$60,000 at foreclosure sale two weeks ago. It is the plan of the new administration to materially increase the production, but no new buildings are contemplated this year. A miscellaneous list of tools and machinery will be purchased from time to time.

The Porto Metal House & Garage Company, Milwaukee, has been organized by J. E. Tracy, P. G. Meyer and L. P. Weber to manufacture and market knock-down structures of sheet metal. The initial capitalization is \$5,000.

The Yale Mfg. Company, with works at Oostburg, Sheboygan County, and general offices at Milwaukee, has filed a voluntary petition in bankruptcy, scheduling liabilities at \$27,272.76 and assets at \$29,326.95. The company manufactures automobile parts and mechanical specialties.

Plans are being prepared for a new union freight and passenger depot for the Chicago, Milwaukee & St. Paul and the Soo Line at Menasha, Wis.

The Chicago, St. Paul, Minneapolis & Omaha is building a new roundhouse and machine shop at Altona, Wis., scheduled to be completed January 1, 1914. The roundhouse will contain 25 stalls. L. H. Guion is superintendent of construction.

The Common Council of Sheboygan, Wis., has taken steps toward executing a plan for the construction and maintenance of a municipal electric light and power plant.

The J. I. Case Threshing Machine Company, Racine, Wis., is dredging a basin on Lake Michigan, at its new

foundry plant in Lakeside, Racine, and will construct breakwaters and docking facilities.

The Walter Brewing Company, Menasha, Wis., awarded the construction contract on a new bottling plant and office building to Ulrich & Howmann Company of Neenah at \$12,612, and is now inquiring for equipment.

Capt. J. Lee Knight, 113 South Main street, Fond du Lac, Wis., is perfecting several models of pumps, using compound lever power instead of the suction principle. Local capitalists are interested and may form a company to manufacture pumps using the Knight principle for farm and irrigation purposes, and hydraulic jacks and other articles employing the method.

The Killen-Walsh Mfg. Company, Appleton, Wis., has started on a regular production of caterpillar type gasoline tractors for farming, logging, and other purposes. The standard tractor is propelled by a 40-hp. gasoline motor and weighs about 7000 lb.

Cleveland

CLEVELAND, OHIO, June 3, 1913.

Machinery dealers report a slight improvement over the previous week but the market generally is quiet. Outside of single tools practically no demand is shown. Little business is coming from the large users of machinery. The demand for second-hand machinery continues fair. While May as a whole was not an active one in the machinery trade, local dealers generally did a larger volume of business than in the previous month. Manufacturing plants in general are well filled with work and are running at full capacity. New orders for the various products appear to be coming out in fairly good volume. Conditions in the foundry trade continue satisfactory.

The Columbian Hardware Company, Cleveland, has been reorganized and reincorporated with a capitalization of \$500,000, and increase of \$200,000 over its former capital stock. The president of the new company is Julius Tuteur, who is also president of the Republic Structural Iron Works Company, and of the Duplex Hanger Company, Cleveland. H. F. Seymour is vice-president and treasurer, and A. V. Cannon is secretary. The company manufactures blacksmith vises, anvils, automobile forgings and a line of hardware goods.

The Kouyoumjan Electric & Mfg. Company, Cleveland, has been incorporated with a capitalization of \$100,000 to manufacture a generator to supply electrical current for automobile lights and for a self-starting device. The company is at present making some of its products in the Commercial Building, where its offices are located. H. K. Kouyoumjan will be president of the company.

The Gibson Motor Car Company will locate its plant in Alliance, Ohio. The company has closed a deal with the Board of Trade of that city, which has donated a site near the plant of the Davies-Bach Company. The plant will consist of four brick buildings, two 85 x 250 ft. and the others 40 x 60 feet and 50 x 70 ft.

The Akron Reflector Company, Akron, Ohio, has made arrangements for the erection of a glass factory in Clarksburgh, W. Va. The building will be of steel and concrete 60 x 130 ft. The company manufactures automobile lights.

The Silver Lake Aviation Company, New Berlin, Ohio, has commenced the erection of a plant for the manufacture of aeroplanes.

The stockholders of the United States Automatic Company, Amherst, Ohio, have approved plans for the erection of a plant addition, work on which will be started in the near future.

The Troy Pattern Company, Troy, Ohio, maker of wooden and metal patterns, is building a new plant 30 x 46 ft.

The Starr Drilling Machine Company, Akron, Ohio, will enlarge its plant by the creation of two factory buildings.

William Muehlfeld, of the firm of Muehlfeld & Holmes, Norwalk, Ohio, has purchased a three-story factory building at East Monroe street and North Linwood avenue, in that city. It will be fitted up for automobile repair work and for the rebuilding of automobiles.

The Manhattan Spring & Bed Company, New York, has leased factory quarters at 2104 Woodland avenue, Cleveland, in which it will open a branch factory.

The New York Blower Company, Bucyrus, Ohio, has made an agreement with the council committee of

that city to purchase the Schunk foundry plant in Bucyrus and build a large addition to this plant. The company has agreed to expend \$24,000 for the old plant and additions, about \$19,000 of which will be in new buildings and equipment.

The Rex File & Saw Company, Newcomerstown, Ohio, has commenced the erection of a plant addition 54 x 100 ft. to be used as a forging room. The company's capacity will be about doubled.

The city of Cleveland, through W. J. Springborn, Director of Public Service, will receive bids June 11 for coal chutes with air operated gates for the municipal lighting plant.

Cincinnati

CINCINNATI, OHIO, June 3, 1913.

Several of the railroads are quietly purchasing machine tools, but the largest list before the trade is one issued by the Pennsylvania Lines West several weeks ago. Only part of the tools on this list have been bought, and included in the unplaced orders there are 12 lathes, of different sizes. Considerable Government business is under negotiation. Export business in all lines is still slow, but a change for the better is anticipated before the summer is over. Second-hand machinery dealers report a slackening demand for almost all kinds of rebuilt machinery. Electrical equipment and supplies of all kinds show some improvement.

The Sheffield Tool Steel Company, 77 Elm street, Cincinnati, has incorporated under the laws of Kentucky with \$10,000 capital stock. The company is the American representative for the John Henry Andrew Company, Birmingham, England. A larger stock of tool and forging steels will be added at an early date.

M. C. Kennett, Cincinnati, will erect a two-story brick and concrete garage at Reading road and Dorchester street. A small repair shop will be operated in connection with the garage.

The Troy Foundry Company, Piqua, Ohio, has rebuilt its foundry, which was badly damaged by the recent floods, and is now operating with a full force.

The Birmingham Metal Products Company, Birmingham, Ala., advises that it has commenced work on a branch plant at both Portsmouth, Ohio, and Memphis, Tenn. The Portsmouth branch will be known as the United States Sheet & Metal Culvert Company, and the Memphis plant will be operated under the name of the Birmingham Metal Products Company.

The Columbus Mill & Mine Supply Company, Columbus, Ohio, has let contract for a large brick warehouse addition.

The N. A. Curtis Mfg. Company, Columbus, Ohio, recently incorporated with \$15,000 capital stock, will soon let a contract for a factory building to be erected on a site selected on West Broad street. The company will manufacture show cases, carpet sweepers and other specialties.

The Louis W. Keyer Company, Dayton, Ohio, cigar box manufacturer, will rebuild its factory recently destroyed by fire.

The Lafayette Light & Power Company, Coshocton, Ohio, has been incorporated with \$10,000 capital stock, to operate a light and power plant. C. H. Howell and K. K. Garrett are named among the incorporators.

Edward H. Morgan & Co., Cincinnati, plumbing contractors, have commenced work on a new shop and storeroom that is located adjoining its present plant at 3480 Reading road.

A garage and automobile repair shop will be built by J. D. Campbell, Cincinnati, at Reading road and McMillan street. The proposed structure will be 40 x 80 ft., one story.

The Western Drop Forge Company, Marion, Ind., is constructing a large addition to its plant, to be used mainly for storage purposes.

The Cincinnati Power Company, recently incorporated with \$10,000 capital stock, will erect a power plant in the near future. Plans are not yet ready for publication. The incorporators are Henry M. Bentley, W. B. Mente, C. M. Stegner, B. S. Hughes and I. Wingfield, all of Cincinnati.

The Murray Iron Works, Detroit, Mich., has secured a contract for the mechanical stokers for the Gibson House, which is now under construction.

The proposed addition to the plant of the Hamilton Foundry & Machine Company, Hamilton, Ohio, recently mentioned, will be 60 x 450 ft., one story and of brick construction. The contract has been awarded.

The city of Zanesville, Ohio, will probably issue bonds for building a waterworks system before the present year has passed.

A small lot of woodworking equipment will be required by the Abell Box Company, Zanesville, Ohio, which has decided to rebuild its plant, recently destroyed by fire.

The Webb Lumber Company, Portsmouth, Ohio, has plans under way for the construction of a large planing mill.

Wheeling

WHEELING, W. VA., June 3, 1913.

The J. E. Moss Iron Works, Wheeling, W. Va., has been incorporated to manufacture and sell iron, steel, etc. Capital stock, \$100,000. Incorporators are J. E. Moss, E. A. Moss, W. E. McKibben, Wheeling, and H. M. Naugle, Canton, Ohio.

The National Reflector Company, Lewisburg, W. Va., has been chartered with capital stock of \$25,000 to manufacture glass reflectors and other glass articles. The incorporators are Joseph Hoover, W. H. Whitfield, Steubenville, Ohio; E. E. McGalliard, S. W. Jenkins, Akron, Ohio; F. H. Wyatt, Cuyahoga Falls, Ohio.

The Sharp Sand Company, Moundsville, W. Va., has been incorporated with \$10,000 capital stock by Thomas Scott, W. G. Srodes, S. W. Booher, James T. Miller, Virginia B. Miller, of Moundsville, W. Va.

The W. A. Stone Fuel Company, Moundsville, W. Va., has been incorporated with a capital stock of \$50,000 to mine coal and manufacture coke. The incorporators are W. A. Stone, William L. Gans, H. B. Gans, Albert Gaddis, S. W. Jones, Uniontown, Pa.

The Boxley Brothers Company, Huntington, W. Va., has been incorporated with a capital stock of \$25,000 to carry on a general contracting business. The incorporators are J. B. Biscoe, F. W. Riggs, N. M. Murphy, J. T. Troeger, J. E. Miller, Huntington, W. Va.

E. J. McJunkin has organized the McJunkin Machine Company, which will build a machine shop at Sistersville, W. Va.

The Athens Glass Company, Morgantown, W. Va., has been incorporated with \$100,000 capital stock to manufacture pressed and blown glass tumblers and other glass articles. Incorporators are J. M. Wood, E. B. Stone, George M. John, E. M. Grant, Morgantown, W. Va.; Howard A. Kaufeld, Star City, W. Va.

F. Schenk & Sons, Wheeling, Va., will erect a large electrical plant.

The Central South

LOUISVILLE, KY., June 2, 1913.

While May was not all that it might have been, in the opinion of machinery interests, it was not a discouraging period by any means, and members of the trade are starting on the final month of the second quarter with fine prospects for business. A little more activity has developed in the power equipment line, while woodworking and sawmill machinery continue to sell well. Machine tools have been a feature of somewhat more importance than usual lately, automobile repair shops being responsible for the purchase of a good deal of equipment of this kind. In fact, the South is just now buying automobiles in really large number, resulting in constant additions to the number of garages and repair shops, and a consequent increasing call for metal working machinery of all kinds.

The Louisville Railway Company has completed the construction of its new shops and car barns at Twenty-ninth street and Broadway, and is now purchasing equipment. The contract for the water tube down-draft boilers which had been specified was let to the Henry Vogt Machine Company, Louisville, together with that for the 150-ft. steel stack. The railroad company will need woodworking machinery and machine tools for this shop. Helm Minary may be addressed.

The Mengel Box Company, Louisville, has purchased a block between Eleventh and Twelfth streets and Ormsby avenue and Wilson street, and will use it for an addition to its large wooden box factory. The company has not yet announced detailed plans for the improvement. H. P. Roberts is secretary and treasurer of the company.

The Ballard & Ballard Company, Louisville flour miller, is contemplating an addition to its electrical equipment which may involve letting contracts for a 200-hp. installation. The concern has been adding to

its power equipment steadily of late, and has bought a considerable amount of electrical apparatus.

The contract for the building to be occupied as an addition by Wm. Schuff & Co., Louisville tanners, has been let by Gray & Wischemeyer, architects, and the machinery purchases will be arranged for in the immediate future. No power machinery will be needed, it is stated.

Arthur Smith, a Louisville architect, has drawn plans for a heating and ventilating system to be installed in a public school building at Marengo, Ind. Address the board of trustees there for details as to the time of opening bids, etc.

The contract for the new enameling building of the Standard Sanitary Company's Louisville plant has been let, and the company will buy the equipment, consisting chiefly of furnaces, in the immediate future. Theodore Mueller is superintendent.

The coffee roasting establishment of A. Englehard & Sons, 805 West Main street, Louisville, was damaged last week by fire to the extent of \$15,000. Most of the motors can be repaired, but the roasters and other equipment will have to be replaced, it is thought.

J. Schwarzwald & Sons, Louisville coopers, have definitely decided on plans for a new plant, which will be located at Eighteenth and Magnolia streets, and Arthur Smith, architect, is arranging to take bids. The machinery requirements will be large. Arthur Herb is manager.

A traction line may be built into Louisville from Chattanooga, Tenn., according to plans of the Chattanooga Traction Company, which is working on suburban lines out of that city, and will be operated with current from the waterpower plant of the Chattanooga & Tennessee River Power Company at Hale's Bar, Tenn.

The sawmill of the Wood Mosaic Company, the offices of which are in New Albany, Ind., was destroyed May 29. The mill is located at Highland Park, a Louisville suburb. The mill building, power plant and dry kilns were burned, the total loss being \$65,000. William A. McLean is president and general manager of the company, with headquarters in New Albany.

The Board of Trade of Middlesboro, Ky., is interested in the construction of a large central power plant to serve the coal mines of that district, as well as a number of smaller communities. It is understood that Stone & Webster, Boston, are contemplating building such a plant.

The Cumberland Motor Company, Pineville, Ky., is completing the installation of the machinery purchased for its new plant, and will begin manufacturing at once. The concern will turn out a spring motor for use on sewing machines.

The Ashland Foundry & Machine Company, Ashland, Ky., reports a heavy demand for equipment for scenic railways, in which it specializes.

J. M. Miles & Son, Eminence, Ky., are installing a woodworking and machine shop. They will operate a garage and do automobile repairing. Blacksmithing equipment is also provided for.

Charles Thomas, Ironton, Ohio, is planning the installation of a steam laundry at Ashland, Ky.

Harry Bros., Newport, Ky., have the contract for the installation of 14 iron culverts in Henderson County, Ky. They are to be from 80 to 200 ft. long.

The Rockport Coal Company, Rockport, Ky., will install a municipal electric light plant and a water system. H. L. Tucker is president and manager of the company, which will begin the purchase of equipment at once.

The Graham Glass Company, Pittsburgh, has purchased the old plant of the Evansville Glass Company, Evansville, Ind., and will remodel it, installing a large amount of new equipment. A contract for the electrical equipment and repairs has been let to A. L. Swanson & Co., Pittsburgh. W. D. Graham is general manager of the company and has taken up his residence in Evansville.

The Manufacturers' Association, Nashville, Tenn., is arranging for the installation of a permanent exhibition of products of Nashville factories.

The Evan Motor Car Company, Detroit, Mich., which, as recently reported, will build a factory near Nashville, Tenn., has purchased a site for the plant at Beulah, 38 miles west of Nashville.

A woodworking plant will be established at Harri-man, Tenn., by J. M. Morris, D. L. Morris and others. Hattiesburg, Miss., for the manufacture of bobbins and shuttles.

The Ball Creek Electric Company, Lone Mountain, Tenn., will install a water power plant and de-

velop 75 hp. A turbine water wheel, generator, etc., will be needed. E. H. Yoakum is the manager.

Machine tools will probably be needed by Sidney Riddle, Nashville, Tenn., for an automobile repair shop and garage. Construction of a building has been begun.

The Duck River Light & Power Company, Shelbyville, Tenn., will increase the capacity of its water power plant near Shelbyville by installing an additional turbine water wheel and a generator.

J. F. Woodward, Dayton, Tenn., is in the market for machinery for installation in a shell button factory.

The Gulf Compress Company, Memphis, Tenn., C. C. Hanson, receiver, is in the market for electrical apparatus for unloading freight from steamboats and barges into its warehouse on the Mississippi River at Vicksburg.

Birmingham

BIRMINGHAM, ALA., June 2, 1913.

A twelve days' building trades strike, the first serious labor trouble in Alabama in several years, has been settled, and structural activities resumed. The demand for machine tools fell off considerably in May, but the volume was over the average. There is a steady demand for boilers and engines.

H. L. Badham, Birmingham, and others have secured a \$300,000 interest in the Montevallo Coal Company, Montevallo, Ala., and will enlarge operations. W. S. Lovell, Birmingham, is president.

A. J. Bowron, I. C. Beatty and others, Birmingham, have organized the Oostanaula Mining Company. They have ample capital for the coal mine development which they will make.

The Georgia Packing & Stock Yards Company, Macon, Ga., has been chartered for \$100,000. E. W. Gould and L. L. Gibson, Macon, and John Ruddle, Atlanta, are among the incorporators.

The Bradshaw Milling & Power Company, Augusta, Ga., has been organized by W. E. and James Norrell to establish a power plant and for other purposes.

E. C. Snodgrass, J. W. Gray, R. C. Coffey and others, Scottsboro, Ala., will establish an electric power plant. The Regal Marble Company, Rome, Ga., with capital stock of \$60,000, has purchased quarries near Murphy, N. C. Wilson M. Hardy, Rome, is president.

The Tennessee Fertilizer Company, Florence, Ala., contemplates establishing a small cotton seed oil plant at Jasper, Ala.

The Palmetto Mfg. Company, Palmetto, Fla., has been organized with capital stock of \$100,000 to manufacture crates, etc. Charles Eiseman is president; M. O. Harrison, vice-president; F. Stevenson, secretary; E. G. Sylvester, general manager.

The Riverside Mill, Augusta, Ga., will purchase additional machinery doubling the capacity of the bagging department.

The Planters' Gin & Warehouse Company, Milan, Ga., has been incorporated with capital stock of \$12,000. It will establish a ginnery. J. C. Pickron, J. H. Vaughan and Mack Rawlins are among those interested.

George Land will establish a plant for manufacturing concrete blocks and tile at Manchester, Ga.

The Miakka Land Company will establish sawmills on a tract of 190,000 acres in Manatee and De Soto Counties, Fla., through which a railroad is being built. C. B. Jenkins, Charleston, S. C., is managing director.

St. Louis

ST. LOUIS, MO., June 2, 1913.

Machine tool dealers report satisfaction with the business which they have been getting. The aggregate is running into good figures as a result of the new business, coupled with deliveries on contracts made some time ago. Among the large deliveries being made is included the equipment of the Busch-Sulzer Bros. Diesel Engine Company, whose tools are coming in rapidly and being placed in the large plant. Hopes are to have it in running order by July 1. The demand for second-hand tools is greater than the supply available in standard equipment and dealers would be better pleased if they could satisfy all the requests along this line that they are receiving. Collections are satisfactory.

The City Water Company, East St. Louis, has completed plans for extensive improvements in the plant

at that point. Included in the new equipment will be a new intake tower, two pumps of 10,000,000 gal. daily capacity, a 1,000,000-gal. concrete filter, a 30,000,000-gal. settling basin, and three 10,000,000-gal. clear water basins.

W. A. Brickey, H. B. Barton and Raymond Cook, St. Louis, have incorporated the American Products Company, with \$50,000 capital, and will equip a plant for the manufacture of chemical and allied products.

The Lawson-Cameron Mining Company, Joplin, Mo., has been incorporated with \$20,000 capital by L. C. Moses, W. M. Locket and C. W. Graber, and will equip mining property for operation.

The Oliver Electric & Mfg. Company, St. Louis, has increased its capital from \$25,000 to \$50,000 in order to increase equipment and extend its operations.

The Davis & Hopkins Lumber Company, Princeton, Ill., has been incorporated with \$60,000 capital by L. R. Davis, E. W. Hopkins and John Kirkpatrick, and will equip a planing mill, etc.

The Creason-Grayson Lumber Company, Kansas City, Mo., has increased its capital from \$35,000 to \$50,000 for the purpose of adding to its equipment and extending its operations.

The Herzog Packing Company, St. Louis, has increased its capital by \$25,000 for the purpose of adding to its equipment.

The American Shoe Stock Company, St. Louis, will increase its capital from \$35,000 to \$100,000, and will establish a plant at Centralia, Ill., for the manufacture of shoe heels and other shoe findings.

A public subscription aggregating \$500,000 has been completed at Oklahoma City, Okla., to the bonds of the Cotton Mills Securities, which has plans for the immediate construction of a large cotton mill at that point. The company is incorporated for \$10,000,000.

The Winters Handle Company, Kansas City, Mo., has been incorporated with \$20,000 capital by Herman, Hans and Herbert R. Diercks, and will equip a handle manufacturing plant.

The Best Clymer Mfg. Company, St. Louis, has been incorporated with \$10,000 capital by Rudolph, Walter G. Clymer and Louis Rosen to equip for a general manufacturing business.

The A. J. Sheahan Granite Company, Graniteville, Mo., has been incorporated with \$20,000 capital by Andrew J. Sheahan, J. L. Baldwin and Louis Glasser to equip and operate a quarry.

The Wilson Lumber Company, Kansas City, Mo., has been incorporated with \$300,000 capital by W. F. Ingham, B. H. Landis and J. S. Kirkpatrick to do a general lumber milling business.

The Parker-Faulhaber Laundry Company, St. Louis, has been incorporated with \$20,000 capital by Ross Parker, L. H. Schultz and A. F. Faulhaber, and will equip a plant at once.

The Arkansas Public Service Company, Little Rock, of which U. S. Bratton is president, has been accorded a franchise for the construction and equipment of a hydroelectric plant near Heber Springs, Ark., and will also equip for the distribution of current to surrounding towns.

The Bowman-Blackman Machine Tool Company, St. Louis, will remove to 1513 North Broadway. The company deals in machinery as a general sales agency.

The Poitevant & Favre Lumber Company, New Orleans, La., announces that it has plans for a sawmill and other equipment at Mandeville, La., involving an investment of about \$250,000, the capacity to be about 100,000 feet daily.

M. A. J. and L. Kraus and J. G. Schwarzschild, New Orleans, La., have incorporated the Kraus Bros. Lumber Company with \$300,000 capital to do a general lumber mill business in Louisiana.

The St. Tammany Canning Company, Covington, La., has been incorporated with \$50,000 capital by W. L. Stevenson, E. J. Frederick and A. C. McCormack and will equip a large cannery at once.

The coal mining property of W. H. Chambers, at Centertown, Mo., has been bought by Charles D. Bachelor of St. Louis, who has plans for the installation of a considerable quantity of new machinery.

The Atkins Electric Light and Power Company, Atkins, Ark., has completed plans for the construction and equipment of an electric light plant, and also of a cotton gin. The company is in the market for complete equipment for both plants. W. H. Jones is president.

The Jonesboro Oil Mill & Fertilizer Company, Jonesboro, La., has been incorporated with \$50,000 capital by W. W. Davis and others and will equip a mill at once.

The Baker Cotton Oil Company, Hobart, Okla., has been incorporated with \$20,000 capital by W. U. and

W. C. Baker and W. Long and will equip an oil plant at once.

The Booneville Waterworks Company, Booneville, Ark., has acquired the Citizens' Electric & Telephone Company and is rebuilding the plant. It will require three 50-kilowatt, 3-phase, 2300-volt generators, motor driven pumps and considerable other equipment.

The Morrillton Light & Power Company, Morrillton, Ark., will rebuild its electric light and power plant recently burned with a loss of \$10,000.

A power house, to cost with its equipment about \$50,000, is planned by the Vivian Oil Company, Vivian, La.

The municipal electric light plant at Port Gibson, Miss., has plans for the installation of much new equipment, including boilers, under the direction of H. D. Brownlee, superintendent.

The Kansas City Electric Light Company, Kansas City, Mo., has plans for remodeling its equipment at the Ninth and Blue street station at a cost of about \$50,000.

The Twin City Ice, Light & Power Company, McCurtain, Okla., has completed its plans for remodeling a plant which it has acquired and will add new equipment to enable the development of 140 hp.

The Sears Feed Milling Company, with \$200,000 capital, will erect a plant of considerable size at Chalmette, La., under the direction of President George E. Sears, William J. Castell and Adolph D'Aquin, all of New Orleans.

The Wallace Automatic Bolt & Rivet Machine Company, St. Louis, has been incorporated with \$100,000 capital by J. T. Wallace of St. Louis and W. F. Dowerman and W. A. McCoy of Pittsburgh, Pa., for the equipment of a plant for the manufacture of a patented machine.

The Desha Lumber Company, Arkansas City, Ark., has plans for the equipment of a bandsaw mill at Lake Providence, La., and for the construction of a narrow gauge railroad.

The Home Lumber Company, Roosevelt, Okla., has been incorporated with \$10,000 capital by C. G. and I. A. Simms of Roosevelt and E. L. Culver of Oklahoma City, Okla., and will install a mill at once.

The city of Bartlesville, Okla., will equip an incinerator for the destruction of the city garbage under the direction of the mayor.

The Rockwell Mfg. Company, Camden, Ark., has been incorporated with \$50,000 capital by B. C. Rockwell, J. F. Judd, W. W. Brown and T. J. Gaughan and will equip for the manufacture of door and window screens.

The Gulf States Vacuum Refrigerator Company, New Orleans, La., has been incorporated with \$50,000 capital by G. D. Warriner, Henry Leverich and others and will equip the plant for the manufacture of refrigerators.

The Kansas City Automobile Company, Kansas City, Mo., plans the construction and equipment of a two-story repair shop and garage 100 x 132 ft.

The Auto Repair Company, Bartlesville, Okla., has been incorporated with \$12,500 capital by T. P. Fisher, John H. Brennan and W. M. Davis and will equip a repair shop.

The city of Maryville, Mo., has completed plans for the installation of a water works plant with pumps of 1,000,000 gal. capacity, duplex direct acting; also two low service split centrifugal pumps of 1000 gal. per min. capacity, an electric generator, and other necessary equipment under the direction of F. L. Flynt of Maryville and Hiram Phillips, engineer, St. Louis.

The city of Richton, Miss., has plans for the equipment of a waterworks plant at a cost of about \$10,000.

The city of Cheyenne, Okla., has completed plans for a waterworks plant to cost about \$60,000, the mayor to have charge of the work.

George P. Crumbaugh, St. Louis, is in the market for corrugated paper and roofing paper machinery for a plant which he is equipping at 5126 North Second street.

The Pacific Coast

PORTLAND, ORE., May 27, 1913.

Present financial conditions and a slight weakening of the lumber market are not conducive to increased activity in the machinery line, but there has been no perceptible curtailment in the buying of machine tools, the aggregate sales of local merchants proving fairly satisfactory. Few important additions are being made to the larger shops in this district, but most of them

are well occupied, and frequent orders are coming out for single tools and small groups to replace old machinery. There is also a good volume of small business from the interior, where a good many small shops for general repair work are being equipped. Crop conditions in Oregon, Washington, and Idaho are good.

The output of Columbia River logging camps has been heavy, resulting in some accumulation, but it is reported that most of the camps will continue work to July 1 before closing for the usual midsummer vacation. While the lumber situation is less encouraging than early in the spring, mills are still putting in improvements, and the great majority of new projects are going ahead, bringing out even more demand than before for mill machinery. Numerous plants are being equipped with electric power, the tendency in this direction showing stronger than ever. There is also considerable business from municipal and public service improvements, and while some curtailment of hydroelectric development is reported, work is going forward rapidly on several projects.

Shipments of machinery to the Orient continue large. Judging by advance bookings and shipments already made, it is believed that the movement of implements through Tacoma, Wash., to Vladivostok will be larger than ever this year, and a cargo recently taken by a Japanese liner included electric mining and mill machinery valued at \$100,000.

It is reported that H. E. Wooley, formerly of Trenton, N. J., will start a plant at Seattle, Wash., for the manufacture of chain, beginning with 12 fires.

The Pacific Iron Works, Portland, expects soon to occupy a 6-acre site at East Twenty-ninth street. The buildings will include a steel structural shop 60 by 600 ft.; a foundry 60 by 200 ft.; a machine shop 60 by 200 ft., and a pattern shop 50 by 100 ft.

The Eccles & Smith Company, of San Francisco, Portland, and Los Angeles, has secured the Pacific coast agency for the Norton Grinding Company, Worcester, Mass.

It is expected that the Seattle Construction & Drydock Company will get the contract for constructing the naval submarine tender Bushnell, its bid of \$918,893 being lowest. The vessel will be 400 ft. long, with a capacity of 3250 tons, and will be equipped with a large machine shop and heavy hoisting machinery.

Work is now under way on the Puget Sound Mills & Timber Company's large plant at Port Angeles, Wash., which will have a capacity of 500,000 ft. daily. A contract was recently let for the power house at a figure of \$100,000.

The Crown Columbia Paper Company has about completed the installation of its new equipment at Camas, Wash., including the largest Fourdrinier machine in the world, and will put the plant in operation in a few weeks.

The Pendleton Mfg. Company, Pendleton, Ore., has been incorporated with a capital stock of \$250,000, for the purpose of taking over the Pendleton Iron Works and enlarging the plant. The incorporators are M. S. Aker, manager of the Pendleton Iron Works; W. F. Matlock, W. M. Peterson and L. Swaggert. It is announced that the company will engage in a general implement manufacturing business, making a specialty of certain patented articles.

A contract for constructing a quartz mill at the Tin Top mine, Sunland, Nev., has been let to the Trent Engineering Company, Reno, Nev.

Plans are in preparation for a water system for Pendleton, Ore., involving the construction of 16 miles of concrete pipe line, 18 to 24-in. diameter, and two concrete reservoirs.

The Elmira Lumber Company, Eugene, Ore., is installing a number of new woodworking machines.

Improvements to the Lamb-Davis Lumber Company's mill at Leavenworth, Wash., include a steel loading shed 78 by 200 ft., a lot of improved fast-feed planers with electric motor drive, a complete transfer system, and a device for raising and lowering cars in front of the planers.

The Stillwater Cherry Valley Timber Company, Stillwater, Idaho, has ordered an 87-ton Baldwin locomotive.

The Veness Lumber Company, Winlock, Wash., is equipping its mill with individual motors.

The C. A. Smith Lumber Company, Marshfield, Ore., is adding a 150-hp. General Electric motor to its mill power plant.

J. T. Kerney, formerly of the home office of the Clark Brothers Company, Belmont, N. Y., is now in charge of the Pacific coast branch, Seattle, Wash. The stock of machinery carried at the Seattle branch will be largely increased.

Eastern Canada

TORONTO, ONT., May 31, 1913.

The Dominion Glass Company, Ltd., Montreal, has been incorporated with a capital stock of \$8,000,000 to manufacture glassware, earthenware and crockery and all material and machinery used in such connection.

The Oil Shales Company of Canada, Ltd., Ottawa, has been incorporated with a capital stock of \$5,000,000, by James William Hennessy, of Fort Coulonge, Que., and Angus William Fraser, Harold Duncan McCormick, Louis Simpson, William Lewis Orme and Edward Seybold, Ottawa, to operate a general smelting, retorting and refining business for all kinds of ores and minerals.

The S. B. Foote Company, Ltd., Montreal, has been incorporated with a capital stock of \$100,000 by Walter Robert Lorimer Shanks, Francis George Bush, George Robert Drennan, Herbert William Jackson and Michael Joseph O'Brien, to engage in printing, engraving and publishing and to manufacture paper boxes, stationery, tags and labels.

The Tweed Quarries, Ltd., Tweed, Ont., has been incorporated with a capital stock of \$75,000 by Charles Howard Putnam to manufacture pressed brick, natural brick, drain and sewer pipe, and fire proofing.

The Richard Sheet Metal Specialties, Ltd., Montreal, has been incorporated with a capital stock of \$50,000 by Alphonse Joseph Lavoie, Howard Salter Ross and Oswald Fleming Shearer.

A by-law to raise \$5000 debentures to extend the mains of the St. Catherine's gas plant was carried by a vote of 214 to 39.

Windsor ratepayers, by a practically unanimous vote, indorsed by-laws granting the usual exemptions to the Swedish Crucible Steel Company, Kelsey Wheel Company, Detroit Steel Products Company and Vincent Steel Process Company.

The Preston Chair Company, Ltd., Preston, Ont., asks for a free site and a loan of \$15,000 payable in 10 annual instalments, with interest, the company in return agreeing to erect a three-story brick building, 40 x 150 ft., with a boiler house and dry kiln, to manufacture chairs. Council will take steps to submit a by-law to the ratepayers.

The Provincial Paper Mills Company, Ltd., has been incorporated with a capital stock of \$5,000,000, the amount representing the combined stock of the St. Lawrence Paper Mills Company, Ltd. and the Barber Paper & Coated Mills Company, Ltd. The companies at the present time are under the management of Fred. Duncan, formerly of the Bryant Paper Company, of Kalamazoo, and I. H. Weldon, of Toronto.

The Halifax Power Development Company, Halifax, Nova Scotia, of which S. M. Brookfield, managing director of the Halifax Grading Dock, is the moving spirit has secured a charter to erect a hydroelectric power plant at Indian River, 17 miles from Halifax, and to sell electric light and power to the city of Halifax. The property is said to be capable of producing over 4000 hp.

A brick and tile plant, to cost \$30,000, will be started at Merlin, Ont., by H. P. Bostaph, of Tilbury, and M. Ryan, of Chatham.

Garnet P. Grant, president of the Dominion Bond Company, has placed in London the entire issue of \$1,000,000 6 per cent, first mortgage bonds issued by the Dominion Cannery, Ltd., Hamilton, Ont. The proceeds will finance improvements and additions costing about \$1,500,000. The Dominion Cannery's profits last year were over \$500,000.

The H. E. Talbot Construction Company, Sault Ste. Marie, Ont., has been awarded the contract for the construction of the power dam, power house and paper making plant of the Donnacona Paper Company, at Donnacona, Quebec. The contract involves \$300,000 and was closed in New York. The Talbot Company already has a \$500,000 contract for a paper plant and power dam at Grand Mere, Quebec.

Richardson & Co., brokers, Montreal, announce the merger of the Gananoque Spring & Axle Company, Ltd. the D. F. Jones Mfg. Company, Ltd., of Gananoque, and the Dowsley Spring & Axle Company, of Chatham, Ont. The new company will be operated under the name of the Steel Products Company of Canada, Ltd., and will have a capitalization of \$2,100,000.

Architects in Toronto have just completed a set of plans and specifications for an immense plant for the manufacture of paper and pulp to be erected for the International Paper Company at the town of Deschenes, Quebec, at a cost of \$10,000,000. It is understood that the new plant will be the finest ever erected by the corporation.

The Monarch Belt Company, operating large plants near Buffalo, had a representative in Ridgeway, Ont., looking over numerous sites for the purpose of locating a Canadian branch. If the sale goes through a factory covering three acres will be erected in a short time. Sites were also inspected in Hamilton, Welland and Port Colborne.

The damage sustained by the fire that occurred at the boot and shoe factory owned by Luder Duchaine, Quebec, is greater than at first supposed. The loss, fully covered by insurance, is nearly \$25,000.

The Dennis Wire & Iron Company, London, Ont., special machinery and a new heating system.

The Monarch Belt Company, Ebenezer, N. Y., has plans under consideration for building an extensive branch plant at Bridgeburg, Ont., opposite Buffalo.

The Ontario Pipe Line has arranged to build at Hamilton 80 coke ovens on a site of 28 acres. The plant will produce 7,500,000 ft. of gas per day, which will be sold to the city of Hamilton.

The A. K. Wisner Carriage Company, Ltd., Jordan, Ont., has been incorporated with \$40,000 capital stock to manufacture automobiles, etc. Albert K. and Morgan Wisner and E. C. Snure are the directors.

The Metallic Roofing Company, Toronto, will build an addition to its factory to cost \$12,000.

The Duff Mfg. Company, Pittsburgh, Pa., manufacturer of jacks, has plans under way for a Canadian branch plant at Brantford, Ont. The initial buildings will comprise a machine shop and assembly room.

The Lumen Bearing Company, Toronto, has commenced work on an addition to be made to its plant at West Toronto.

Western Canada

WINNIPEG, MAN., May 30, 1913.

The local machinery firms are fairly busy filling orders for small lots of machinery and parts, but the volume of business is not quite so large as at the corresponding time last year. Money tightness is still to a considerable extent a factor in the situation. There are indications of an active demand for grain elevator machinery in the western provinces during the summer months. Municipalities will be liberal purchasers of waterworks and lighting machinery. The railroad companies will make big improvements in machine shops.

The P. Burns Company, Ltd., meat packer, Calgary, Alberta, with many branches throughout the West, contemplates building an abattoir and cold storage plant at South Fort George, B. C.

The Smart-Woods Company, Ltd., cotton and jute bag manufacturer, Winnipeg, is trebling the capacity of its plant here, and contemplates establishing a factory at some point west of Winnipeg in the near future.

It is said that eastern Canada capitalists who have heavy holdings in the Edwardsburg Starch Company, Ltd., Montreal, are preparing to erect a million-bushel corn elevator at Port Arthur, western Ontario. It is expected that the company will also establish a number of branch starch factories at different points.

The Harkness Flour Milling Company, Carman, Man., will erect a mill with a capacity of 200 barrels per day at Taber, Alberta.

The city of Edmonton, Alberta, is planning to erect a power station. The clerk is C. E. Cox, and the architect, A. J. Jeffers.

It is reported that the E. W. Bachus Company, which has large interests at International Falls, Minn., and Fort Frances, Ont., will erect a 100-ton pulp mill at Kenora, western Ontario.

The W. H. Dwyer Company, Ltd., Fort William, will erect a 100,000-bushel grain elevator fully equipped with drying and cleaning machinery.

The Spencer Grain Company, Ltd., Winnipeg, Man., has been incorporated with a capital stock of \$149,000 by Chessman G. Spencer, Laura Burdette Spencer, Earl Sherwood Farewell, Albert Edwin Bowles and Hugo Launcelot Jackson, all of Winnipeg, to clean, store and crush grain.

Fire destroyed the mill belonging to T. K. Smith, Armstrong, B. C., doing damage to the amount of \$10,000. He will rebuild.

The Saskatchewan Co-Operative Elevator Company will erect 35 elevators at a cost of \$402,000 at various points in the province this year.

The Egon von Parnap Company is negotiating with the City Council of Regina, Sask., with a view to establishing a sandlime brick plant in that city. The plant would cost \$80,000. A stove company is also negotiating for a site in Regina.

A large lumber mill will shortly be built on the north shore of Port Moody by the Vancouver Timber & Trading Company, of which Alvo von Alvesleben, Vancouver, is managing director. The cost of the mill will be about \$300,000, and it will have an output of 60,000,000 ft. a year. The mill will be electrically operated.

Engineers are now engaged in detail surveys and estimates of what is planned to be the largest hydro-electric power plant in the province of British Columbia. At an expenditure that will ultimately reach between \$12,000,000 and \$15,000,000, 300,000 hp. is to be developed, from the falls of the Campbell River, on Vancouver Island, by the Campbell River Power Company. George C. Hinton, of the Hinton Electrical Company, is one of the promoters of the new company. Water rights and incorporation have been secured, and a start on the first unit of the plant is anticipated as soon as the engineer's estimates are in hand.

The Metal Shingle & Siding Company, Saskatoon, Sask., will erect a plant to manufacture metal shingles, cornices, corrugated iron, metal siding and roofing.

The following companies have been incorporated in Alberta: Jackson Water Supply Company, Ltd., Calgary, capital \$50,000; Bow City Car & Foundry Company, Ltd., \$500,000, Bow City; the Taber Industrial Company, Ltd., Taber, capital, \$20,000.

Government Purchases

WASHINGTON, D. C., June 2, 1913.

The Isthmian Canal Commission will open bids July 21, under circular 778, for furnishing two lock entrance floating caissons and their equipment for use at the lock entrances of the Panama Canal. The contract includes the furnishing of all material and labor, including pumps, motors and piping, valves, etc. The principal dimensions of the caissons are: Extreme length, 113 ft. 10 in.; length between vertical ends, 112 ft. 6 in.; depth at side, 65 ft.; breadth molded, 36 ft.

The United States engineer office, Pittsburgh, will open bids June 18 for furnishing and installing water power driven air compressor plants at dams Nos. 7 and 9, Ohio River.

The Mississippi River Commission, Liggett Building, St. Louis, will open bids June 18 for the construction and delivery of a steel derrick and machinery.

The United States engineer office, Galveston, Texas, will open bids June 27 for lock valves, operating gear, etc.

The Department of the Interior, Washington, will open bids June 24 for the installation of an addition to the coal and ash handling machinery in the old post office building, Washington, D. C.

The Department of the Interior will receive bids until June 25 at the office of the United States Reclamation Service, Elephant Butte, N. M., for furnishing sluice and penstock gates and accessories for the Rio Grande project.

The Department of the Interior will receive bids at the office of the United States Reclamation Service, Boise, Idaho, until June 16, for furnishing sluice gates for the new Jackson Lake dam.

The Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until June 21 for furnishing electric traveling cranes for the Puget Sound navy yard. The contract covers one 20-ton four-motor with 5-ton auxiliary; one 5-ton one-motor; one 3½-ton three-motor traveling bridge crane; one 5-ton three-motor traveling wall crane with trolley wire and support complete.

The Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until June 24, schedule 5538, for an electric traveling crane, three-motor, for the Brooklyn navy yard; schedule 5532, for a Diesel engine and alternating current generator and a motor generating set and an engine-driven unit, direct current, for Annapolis; schedule 5527, milling machines for San Francisco.

The Bureau of Supplies and Accounts, Navy Department, Washington, will receive the following bids until June 17: Schedule 5521, for a back-knife gauge lathe, for the Portsmouth Navy Yard; schedule 5515, for a blue print machine for the Newport Navy Yard; schedule 5529, for a cold saw cutting-off machine for Washington; schedule 5525, for shears for the Brooklyn Navy Yard.

The U. S. Reduction Company, Chicago, whose works are at East Chicago, Ind., announces that it has concluded arrangements whereby its facilities for supplying the trade with aluminum and its alloys are greatly increased. It is now prepared to make immediate shipment of such material from stock.

Trade Publications

Multiport Exhaust Valve.—Harrison Safety Boiler Works, North Philadelphia Station, Philadelphia, Pa. Booklet of 52 pages. Describes the course of reasoning, selection and elimination which led to the development and perfection of the Cochrane multiport safety-exhaust outlet valve, which was illustrated in *The Iron Age*, November 16, 1911. One of the special features of the valve is that the maximum back pressure is easily controlled from a distance by rods, chains, hydraulic pressure or an electric motor and a predetermined back pressure cannot be exceeded. The valve is described with a number of illustrations, dimension drawings and tables. Charts showing the steam consumption of engines under various back pressures and vacuums is included.

Pulleys, Shafting Hangers and Bearings.—Dodge Mfg. Company, Mishawaka, Ind. Folder. Contains data and illustrations of the way the Dodge products are packed for shipment over the seas. Among the apparatus shown are split pulleys, friction clutches, shafting hangers, pillow blocks, bearings and compression couplings.

Heating Furnaces.—Tate-Jones & Co., Inc., Empire Building, Pittsburgh, Pa. Bulletin No. 3. This bulletin is one of a series devoted to blacksmithing and drop forging work and contains illustrations of a heating furnace for plates for flanging, hot pressing, annealing, etc., for car, boiler, tank and structural shops. A forging furnace for medium forging work, using oil or gas as fuel is also mentioned and a table of dimensions for drop parts is given.

Duplex Milling Machines.—Garvin Machine Company, Spring and Varick streets, New York City. Circular No. 190. Deals with the No. 2 and No. 3 duplex milling machines, the former of which was illustrated in *The Iron Age*, February 27, 1913. Engravings of both machines are given with a brief text description and condensed table of specifications.

Compressed Air Data.—Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill. Bulletin No. 34-L. Is one of a series covering a complete line of air compressors and treats particularly of general engineering information of value to users of compressed air. Tables giving efficiencies of air compression of different altitudes, density of gases and vapors, mean effective pressure and horsepower, loss of pressure due to friction in pipes and many others are included. A number of views of the various types of compressors are shown in miniature, together with illustrations of the interior of the company's plant at Franklin, Pa. An abbreviated telegraphic code for emergency orders is included.

Cranes, Tracks, Trolleys and Hoists.—New Jersey Foundry & Machine Company, 90 West street, New York City. Form No. 358-L. Illustrates the various types of cranes, tracks, trolleys and hoists which can be furnished, together with cars, coal and contractors' buckets and blocks of various types. The folder is made up almost entirely of illustrations, there being practically no text. Among the trolleys shown are the Changeezy and the Delta, both of which were illustrated in *The Iron Age*, January 5, 1911.

Milling Cutters.—Ingersoll Milling Machine Company, Rockford, Ill. Pamphlet. Illustrates a number of different types of milling machine cutters with brief text descriptions and complete tables of the various sizes in which they can be furnished. Mention is also made of the different sizes of milling cutter shanks which can be supplied and the method of attaching and driving face milling cutters.

Belt Treatment.—Cling-Surface Company, Buffalo, N. Y. Booklet entitled "Is there Rosin in Cling-Surface?" A number of reports of chemical analyses made in this country, England and Germany showing that there is no rosin in this belt preparation are reproduced and a partial list of users is included.

Jet and Surface Condensers.—Wheeler Condenser & Engineering Company, Carteret, N. J. Two pamphlets. One of these is a reprint of an article on "Tests of Power Plant Apparatus" which was published in the *National Engineer*, September, 1912, covering tests on a Wheeler counter-current rain type jet condenser. The other pamphlet is a reprint from *Power* of the tests made on a large high vacuum condenser, which was illustrated in *The Iron Age*, February 20, 1913.

Crusher Wearing Parts.—Edgar Allen American Mangane Steel Company, McCormick Building, Chicago, Ill. Bulletin No. 56. Shows a number of wearing parts for gyratory and jaw crushers which are made from Stag brand manganese steel. These include crusher heads, mantles, concave wearing plates, chutes and eccentric and back drive gears and pinions for the gyratory crushers and movable and stationary jaw plates, cheek and toggle or adjusting plates, toggle bearings and chutes for the jaw crushers. Views of all of these are given, together with brief descriptions.

Relief Valve.—Connersville Blower Company, Connersville, Ind. Bulletin No. 9. Describes a non-vibrating relief valve for blower service. These valves can be placed anywhere in the air line, preferably near the blower and are connected by a short nipple. When the pressure in the air line rises above the normal one for which the valve has been weighted, air leaks past two pistons under the cylinder head and raises the cylinder and weights, which are adjusted to balance whatever pressure is to be maintained in the line. Both exterior and sectional views of the valve are given and mention is made of some of the other products of the company, such as blowers, gas pumps and exhausters and vacuum, water and oil pumps.

